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MARCH 1, 1961

AUTOMOTIVE INDUSTRIES

ENGINEERING · MANAGEMENT · PRODUCTION · DESIGN

A CHILTON PUBLICATION

RENAULT PLANT

... STEERING GEAR ASSEMBLY ... Page 38



A prototype installation of an Allison GMT 305 gas turbine is used in this Ordnance Corps modified M-56 90mm gun carrier.

ALSO IN THIS ISSUE . . .

SMALL GASOLINE ENGINES

GAS TURBINES: II—Passenger Car Problems

MOVING BOLSTER PRESS LINE at Fisher

Remember when...

He proved he was the "mechanical man"

It's the fourth game of the 1935 World Series. The Tigers lead, 2-1. And in the last of the ninth the Cubs have the tying run on second, winning run on first, one out. The Cubs' batter hits a sharp grounder to the shortstop who shoots it to Charlie Gehringer at second. With mechanical precision, Gehringer takes the ball, pivots, whips it to first for the game-winning double play.

The "Mechanical Man", as the sports writers called him, had come through again.

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day's full year warranties. For your No. 1 bearing value rely upon the bearing pros. The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.



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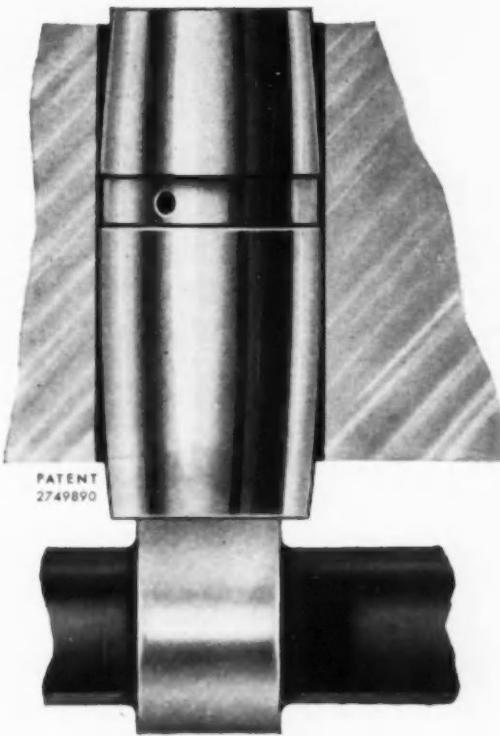


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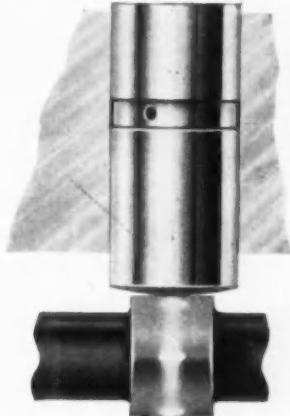
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Spherical-face tappets make only limited area contact with the cam. Result: high unit stress, damaging wear, and pitting.

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CUTTING THROUGH AN AVALANCHE. A 54-foot-deep avalanche of hard, dense snow is no problem for the Snowblast Rotary Plow. Built with shafts and bushings of rugged nickel alloy steels, this

plow "removes two to five times more snow than any other type of rotary plow—even those with greater horsepower ratings," according to Wayne Schiller, of the Colorado Department of Highways.

Snowplow moves avalanches, lays arctic airstrips

Power to move 2200 tons an hour delivered by Nickel Alloy Steels

Chewing through a mountain of snow to rescue a town—laying an airstrip of compacted snow—they're simple jobs for the Snowblast Rotary Plow. From no-stall plowing at one-quarter mph to smooth snow removal at 30 mph, any speed is "the right speed."

The power to move 2200 tons of snow an hour is delivered by a two-speed transmission, using two nickel alloy steels: AISI 4320 and AISI 3140. In dense, hard-packed snow, low gear provides maximum horsepower for the rotary cutter. In light, fluffy snow, high gear provides speeds up to 30 mph—with a snow-casting range of 110 feet.

Four transmission shafts, the impeller shaft, and bevel gear box shaft are all made of AISI 4320 carburized and hardened nickel alloy steel. Its hard case resists metal-to-metal frictional wear—*seizing, galling, and scoring*. Its tough core stands up to repeated

impact in stone-hard snow—even at full throttle.

Bushings for drive and spline are made of AISI 3140 through-hardening nickel-chromium alloy steel. Well suited to parts having sections up to 2", AISI 3140 is readily heat-treated to develop the strength and toughness necessary for dependable resistance to repeated shock-loading.

It's easy to get the latest information on these and other nickel alloy steels for shafts, bearings, pinions, gears and other heavily stressed parts you use, design or buy. Write us for a copy of the new 76-page book, "Nickel Alloy Steels and Other Nickel Alloys in Engineering Construction Machinery."

The International Nickel Company, Inc.

67 Wall Street  New York 5, N. Y.



New Snow Machine Makes Runways. This snow machine comprises the Snowblast Rotary Plow and a special attachment. Tested rigorously in the Arctic, it compacts gathered snow and redeposits it to form a smooth surface—hard enough to permit aircraft landings. Nickel steels give a variety of components strength and toughness for rugged Arctic service.

INCO NICKEL
NICKEL MAKES STEEL PERFORM BETTER LONGER

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

MARCH 1, 1961

VOL. 124 No. 5

Passenger Cars • Trucks • Buses • Aircraft • Tractors
• Engines • Bodies • Trailers • Road Machinery •
Farm Machinery • Parts and Components • Accessories
• Production and Processing Equipment •
Design • Production • Engineering • Management

Features • • •

▼ Small Gasoline Engines

Applications of small gasoline engines are increasing in variety and in overall volume. While figures for 1960 are not yet available, 1959 shipments were 7,179,565—close to 25 per cent above the figure for 1958. Recent developments by some of the builders are described in a four-page article.

Page 29

▼ Hydrostatic Transmission for Mobile Equipment

A new hydrostatic transmission is offered by the Watertown Division of The New York Air Brake Co. Present production models have been designed for installations such as the traction drive on lift trucks, front end loaders, farm tractors, combines, and other off-highway vehicles.

Page 33

▼ Automotive Gas Turbines Part II

This article describes and illustrates the various types of heat exchangers used in gas turbines. Performance and efficiency are discussed, as well as problems in the application of gas turbines to passenger cars.

Page 34

▼ Assembling Steering Gears on Automatic Transfer Lines

The Renault plant at Billancourt, France, is assembling rack-and-pinion steering

gears for the Dauphine car on an automatic transfer line with a capacity of 150 units per hour. The line has a loading station, 11 fully-automatic stations, and four semi-automatic locations. A total of 11 men are employed on the line. Page 38

▼ Moving Bolster Press Line

The Fisher Body Plant in Grand Rapids has a moving bolster press line for short runs in any variety within the capacity of the equipment. This is said to be the first installation of its kind in the USA.

Page 42

▼ Reliability Program at Oldsmobile

Oldsmobile has taken a novel approach to the inauguration of a reliability program. The division is basing its program on what it terms a "feed-back" system. This takes into account what is happening in the field, what parts give trouble, etc. Page 44

▼ 18 New Product Items and Other Features Such as:

Machinery News; Manufacturers' News; Automation News Report; Industry Statistics; Airbriefs; Metals; and News of the Automation and Aviation Industries.

... continued on next page

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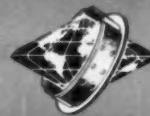
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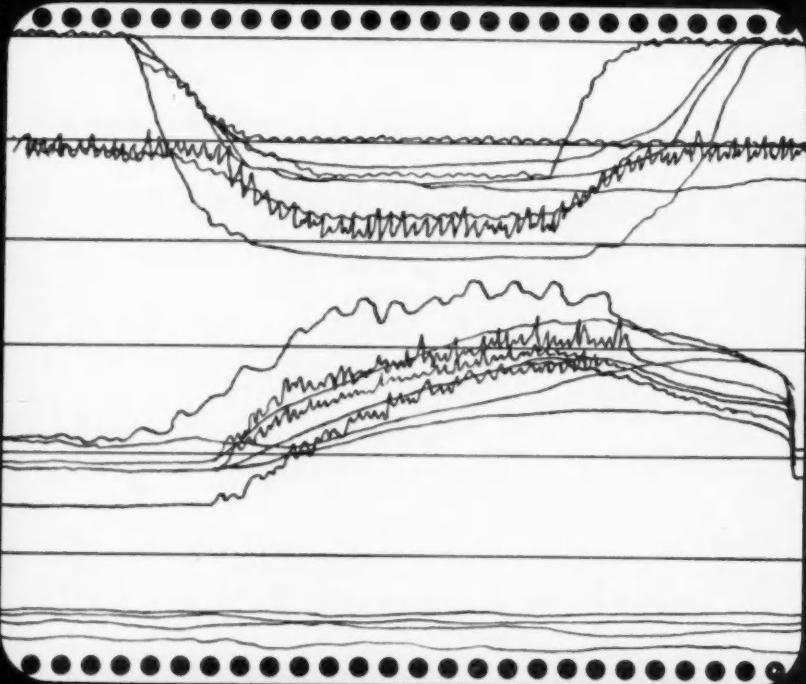
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for you



Newest Bendix Mobile Brake Laboratory ready to take to the road with its electronic test equipment to check out heavy-duty brakes.

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six vital areas: 1. air and hydraulic actuating pressure; 2. deceleration; 3. stop time; 4. lining, drum, and hydraulic fluid temperatures; 5. travel of actuating cylinder pistons; 6. stopping distance. This charted data enables Bendix engineers to determine the exact degree of braking efficiency.

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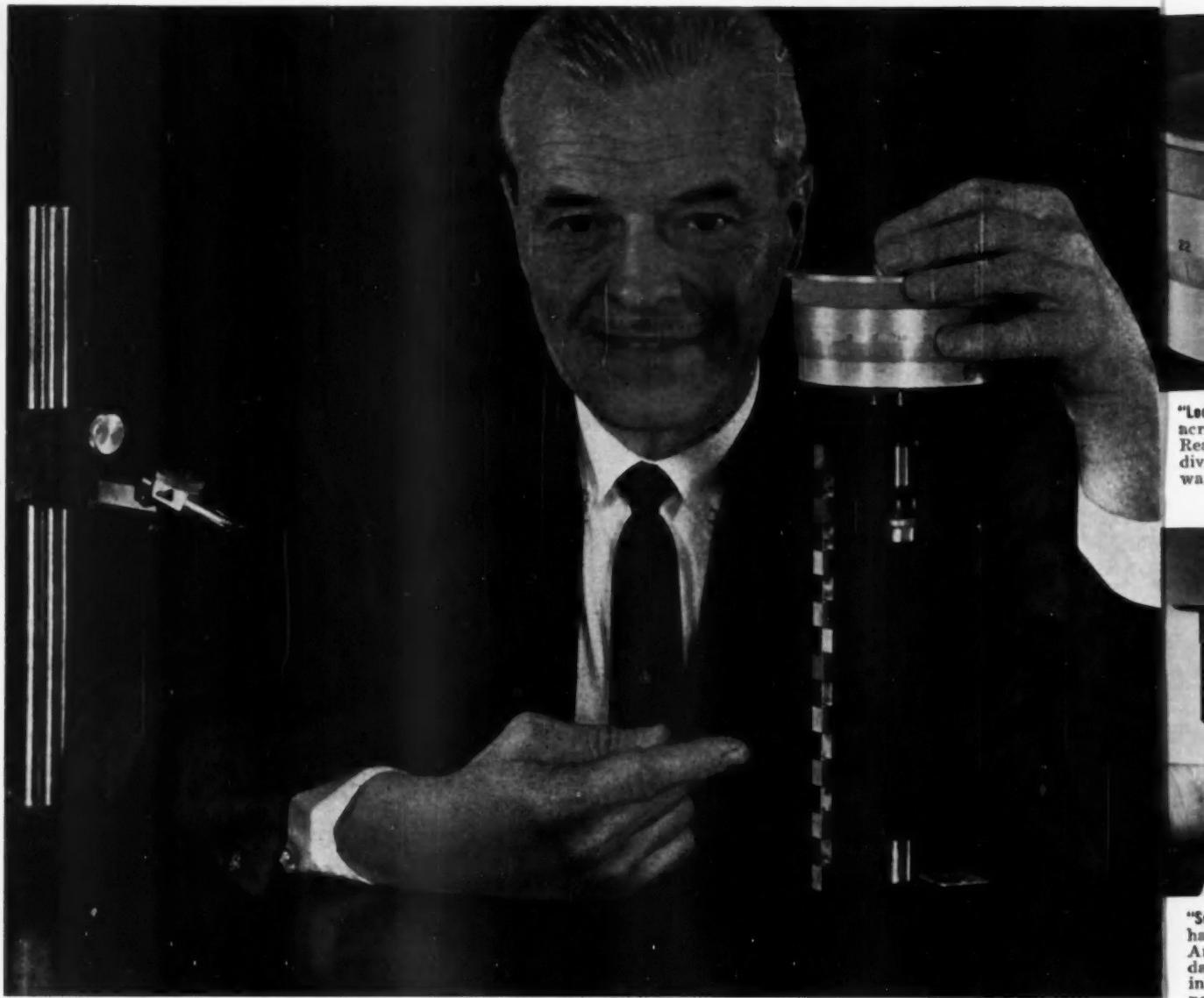
Bendix PRODUCTS DIVISION South Bend, IND.

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CORPORATION

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"Let me show you why Brown & Sharpe is the best height-setting tool."

... Mr. Ermand Watelet, Director of Sales



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"You see — Hite-Set has a series of half-inch precision blocks, locked in a carrier on one-inch centers. A super-

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"You just pick the right block — turn the head to your ten-thousandth reading. The top of the block is then at the height you want, ready for transfer.

What could be quicker!

"Setting the bottom of blocks is easy, too, *without* attachments. You just subtract .5000".

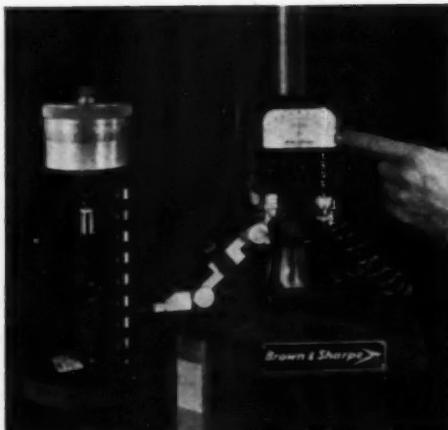
"If you want even faster setting, there's Brown & Sharpe's 'Hite-Icator'. It's a Hite-Set with a dial indicator added that shows .1", .01" and .001".

Brown & Sharpe's new Hite-Set height gage tool you can buy!"

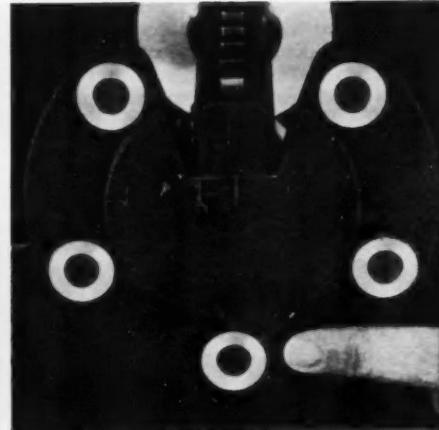
For design, Brown & Sharpe, Industrial Products Division



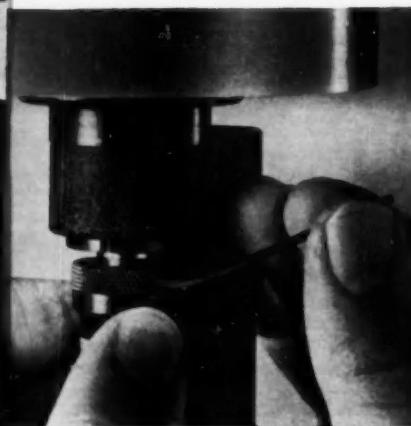
"Look at this easy-reading head! It's a full 4" across — the biggest in the business. Reads directly in tenths, and spreads the divisions out so you can see them all the way across a big surface plate or machine.



"See the accuracy you get — within .000050" over the entire range of blocks, and highly repeatable! You read off a small parallel surface, moving up and down, not, as in some tools, off a large rotating disk.



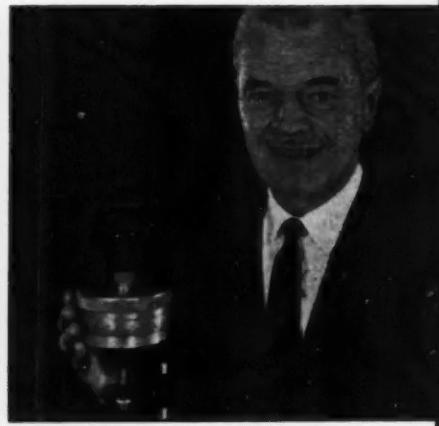
"Base is solid as a rock! These five big buttons are hardened and lapped to better than Class A Gage Block accuracy, so your Hite-Set won't tilt. (If it does, you need a new surface plate from Brown & Sharpe!)



"See the simple zero adjustment — You don't have to take the head off to set to "zero". Another feature: Repairs are economical; damaged Hite-Set blocks are replaced individually — you don't need a whole new column.



"Companion pieces to do any job better are available from Brown & Sharpe. Super Hite.Chek® (a) transfers heights in .000025", 9" Riser Blocks (b) extend range at low cost. B&S Black Granite plates and flats provide a perfect base.



"Finally, you pay less for Hite-Set accuracy. When the range of heights you want to measure is considered, you will find that combinations of Brown & Sharpe Hite-Sets and Riser Blocks usually cost less per inch of range than competitive tools."

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ON OUR WASHINGTON WIRE



Justice Dept. officials say the antitrust action against the Nation's biggest electrical equipment manufacturers is not the start of a "get tough" policy. But they say the case is a warning to industries which might be considering similar practices. W. Wallace Kirkpatrick, acting head of the Antitrust Div., says the verdict is a warning to all big business.

The right of industry to retain ownership of patents on research sponsored by government funds is under review. The Defense Dept. is considering changing its patent practices to the detriment of industry. The Pentagon may decide to retain the rights to patents developed under government contracts. A Congressional fight over the policy is imminent.

President Kennedy's demands for a steady upward push in minimum wages—\$1.25 by 1963—has strong backing from Senate and

House Labor Committees. At the same time, there is mounting opposition from retail interests and foreign relations experts. With both political parties committed to higher wages, there is little doubt some kind of new wage-floor bill can be passed this year, although there is some talk of waiting until 1962—an election year—to write the higher rates into law.

The Internal Revenue Service's fight against the use of foreign "tax havens" by U. S. companies has the backing of President Kennedy. He recommends that Congress pass a law to prevent U. S. firms from using "tax havens" abroad to escape U. S. levies. He also has ordered the Treasury Dept. to find out whether U. S. tax laws are driving "undue amounts" of American capital from this country.

A spurt in buying of U. S. machines by Japanese industry will come soon. The Export-Import Bank has extended a \$25 million credit to a dozen Japanese banks. The proceeds of the credit will buy machine tools, forging and rolling machines.

A government controversy has erupted over shipment of 45 U. S.-made ball bearing machines to the Soviet Union. At odds are the Dept. of Commerce, Dept. of Defense, and Sen. Thomas Dodd (D., Conn.). Commerce officials okayed shipment of the machines on the grounds that machines of comparable quality could be bought in Europe. The Defense Dept. asked that the machines not be shipped. Commerce suspended the export license but later reinstated it. Sen. Dodd says he would have liked the suspension to have remained in effect, but is keeping an open mind on the matter.

The outlook for a tax break on new plants and equipment is brightest in years. The Kennedy Administration concedes more realistic write-offs are long overdue, and more Congressmen are coming around to the idea. There's still opposition, however, chiefly from a die-hard band within Congress that opposes "favors" for industry.

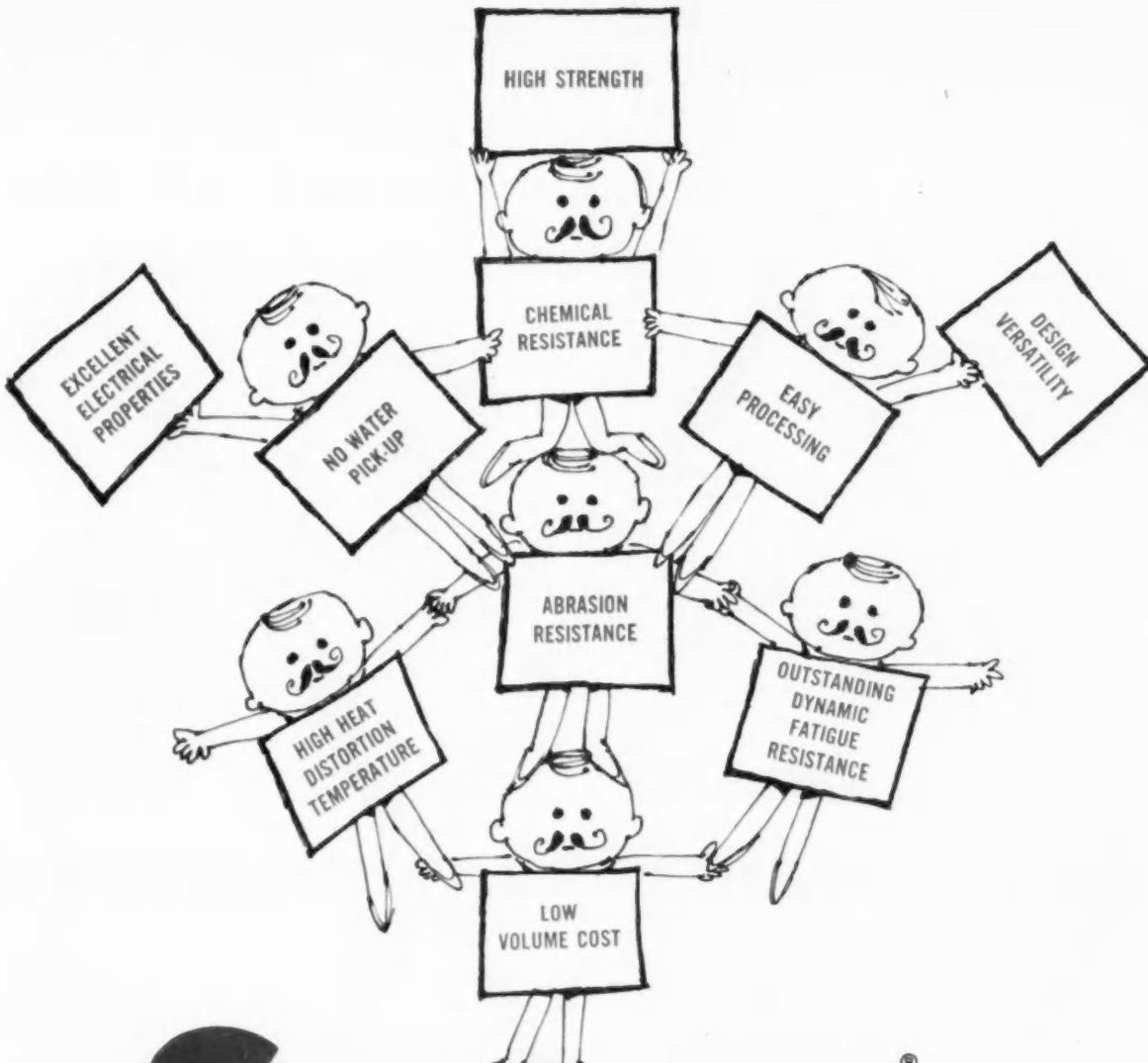
The President now is soft-pedaling talk that the White House wants to take over strong direction of the independent regulatory agencies. For the time being, at least, the President also is softening the idea of the role James M. Landis will play in future regulatory planning.

Attorney General Robert Kennedy is stepping up the government crackdown on illegal sales of "bennies" and "goof balls," nicknames for stay-awake drugs. In a recent action, the Justice Dept. opened a state-wide drive in Alabama, and filed 41 criminal charges. It was the first state-wide crackdown, and was aimed at truck stops, restaurants, and filling stations.

Another move to force the government to equip all its vehicles with seat belts is being made. Rep. Kenneth Roberts (D., Ala.) chairman of the House Safety subcommittee, is again sponsoring legislation to require all government-owned trucks and autos to have belts. A similar bill last year passed the House but died in the Senate.

CALENDAR OF COMING SHOWS AND MEETINGS

Material Handling Institute, Spring Meeting, Chicago.....	Mar. 7-9	Society of Automotive Engineers, National Aeronautic Meeting, New York	Apr. 4-7
Instrument Society of America, 11th Annual Conference on Instrumentation for the Iron and Steel Industry, Pittsburgh..	Mar. 8-10	Management Engineering Conference, American Society of Mechanical Engineers, Society for the Advancement of Management, New York City	Apr. 6-7
The Steel Founders' Society of America, Annual Meeting, Chicago	Mar. 11-14	American Society of Mechanical Engineers, Oil & Gas Power Conference & Exhibit, New Orleans	Apr. 9-13
The American Society of Mechanical Engineers, Aviation Conference, Los Angeles.....	Mar. 12-16	American Society of Mechanical Engineers, Maintenance & Plant Engineering Conference, Worcester, Mass.	Apr. 10-11
Society of Automotive Engineers, Automobile Week (Combined National Automobile & Production Meetings), Detroit.....	Mar. 13-17	43rd Anniversary National Truck, Trailer & Equipment Show, Los Angeles	Apr. 13-15
American Society for Metals, Western Metal Exposition, Los Angeles	Mar. 20-24	American Welding Society, 42nd Annual Convention and Welding Exposition, New York. Apr. 10-21	
23rd Annual American Power Conference, Sponsored by Six National Engineering Societies, Chicago	Mar. 21-23	American Welding Society, Welding Show, New York	Apr. 18-20
Spring Technical Meeting, Pressed Metal Institute, New York. Mar. 22-24		18th Annual Western Section Conference, Society of the Plastics Industry, Inc., Coronado, Calif.	Apr. 20-21
American Machine Tool Distributors' Assn., 37th Spring Meeting, San Francisco.....	Mar. 23-25	American Foundrymen's Society, 65th Annual Castings Congress, San Francisco	May 8-12
Instrument Society of America, 3rd Symposium on Temperature, Columbus, Ohio	Mar. 27-31	Design Engineering Show and Conference, Detroit	May 22-25
		American Society of Tool & Manufacturing Engineers, 1961 Engineering Conference & Exhibit, New York	May 22-26
		Society of Automotive Engineers, Summer Meeting, St. Louis. June 5-9	



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Characteristics peculiar to sintered metal place it in a unique position in the metal forming industry. It provides a way to form shapes which are impractical to form by any other means. It permits combination of metals and non-metals which cannot be combined by other processes. It makes possible controlled density or controlled porosity, a fact significant in certain applications. Sintered iron and steel lend themselves to special processes if the application requires special hardness or strength.

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STEAM TREATED PARTS

Iron base materials may be subjected to steam at an elevated temperature to effect controlled surface hardening and sealing. The surface is economically coated with a hard, tight film of wear-resistant black iron oxide.



METAL INFILTRATED PARTS

Certain parts are infiltrated with a copper base alloy to obtain high tensile and compressive strength. Machinability and modulus of elasticity are improved. Separate pieces may be brazed together during this process.



CARBONITRIDED PARTS

Iron base materials may be case hardened by the carbonitriding process. This results in a particle hardness of $R_c 60$ minimum that provides maximum wear resistance. The full impact strength of the core is retained.



PRECISION PARTS WITHOUT MACHINING

When the design recommendations of Delco Moraine engineers are followed, many complicated structural parts may be readily manufactured in large quantities to exacting specifications without secondary machining operations. Reliability and consistency of the parts are inherent.



METAL INFILTRATED AND HARDENED PARTS

Parts which have been infiltrated may be oil hardened for those applications requiring extremely high strength, hardness, and wear characteristics.

Our engineers are available to consult with you at any time and place about new developments and new applications for this basic process. Ask them to explain to you the economies of complex parts made from sintered metals.

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Division of General Motors, Dayton, Ohio





HOB TWO FOR THE PRICE OF ONE

By switching to a lead-treated steel, Thor Power Tool Company cut the cost of these idler gears in half. Aristoloy 4620 (leaded*) provided high strength with excellent wear and shock resistance qualities. On gear cutting operations, machinability jumped from 35% to 66% (of B 1112). And there was a marked improvement in surface finish.

If you would like to know more about the production economies of lead-treated steels possible on hobbing, broaching, milling, and particularly automatic machining operations, write today for LEADED STEELS CATALOG. Or call your nearest Copperweld representative.

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NEWS

Vol. 124, No. 5

March 1, 1961

Major Defense Flaw Scarcity of Orders for Improved Vehicles

By Hartley W. Barclay, Editor and Publisher

Major advances in Army development of new tank-automotive equipment will eventually have their impact upon improved commercial production of all types of civilian vehicles, defense experts have revealed exclusively to AUTOMOTIVE INDUSTRIES.

However, the scarcity of orders for new models of land-operated

equipment indicates the possibility of a serious weakness in planning for production of the improved vehicles, it was stated. Many of the important new designs of engines, transmissions and drives consist of only one or a few prototype models, experts emphasized. They stressed that appropriations for such projects

should be re-evaluated so that a more equitable distribution of defense funds could be provided for in this vital field.

Engine Weights Reduced

Typical important gains which have been achieved in defense vehicle designs through modern research include reduction in engine weights and in ratios of weights to horsepower, plus the use of multi-fuel engine designs, innovations in compression ignition engine prototypes, achievement of power plants with reduced rates of fuel consumption and the design of "throw-away" vehicles. These would be built so economically that they could be destroyed or abandoned after operating failures rather than being hauled back to bases for repairs.

In this vast array of engineering progress only one major flaw appears, according to leading automotive authorities. Defense establishments held the view, according to the Pentagon, that "in the event of national emergency a great number of engines for military vehicles would be required. This problem could be satisfied by utilizing the high production capacity of commercial vehicle producers." Contrary to this view of the armed services, automotive executives said that in any

1961 PEUGEOT 404 HAS SLIDING SUNROOF



Five-passenger sedan is powered by 72 hp slant four engine that provides 90 mph. The wheelbase is 104.3 in. and overall length is 174 in. Preliminary design work on the unitized body was done by Italy's famous Pininfarina.

future emergency it would not be possible to re-convert production equipment quickly to defense production with the same speed and efficiency demonstrated in World War II. Automotive leaders stressed that this is one of the top technical problems faced by the industry today.

Using the concept of conversion to future emergency production of defense vehicles as the example of current problems, automotive executives stressed the following points:

1. Major automotive-tank facilities vital to future defense production are now virtually idle, while large contracts have been placed by the armed services for other products which are not produced in strategically important plants vital to future emergency output.

2. Major staffs of highly specialized automotive engineers have been substantially cut back and reduced by some automotive companies because of a lack of government contracts. No governmental action has been taken to reverse this tragic situation. Setbacks now experienced in maintaining the technical organization of engineers important to fu-

ture defense production represent new barriers to fulfillment of the country's basic objective of obtaining "total mobility" for the armed services.

These problems have not originated with the armed services but have emerged from higher level branches of the Federal government, it was stated. Engineers emphasized that the plans, designs and research developments of the armed services are adequate to provide "total mobility" if implemented by new orders. Examples of typical technical advances include the following developments in engines alone, they said:

1. Vehicles capable of starting and operating satisfactorily in the temperature range of -65 to 115 degrees F.

2. Vehicles capable of safe operation on slope terrain up to 60 per cent.

3. Satisfactory operation at all altitudes from sea level to maximum normal high altitudes.

4. Capability of continuous operation.

5. Capability of fording maximum normal traverse of streams and mud.

6. Minimum fuel consumption under all of the above conditions.

There are additional developments which are now well advanced but can not move ahead further without major high level policy approval, it was learned. For example, research and development is needed on dual engine power plants, combining gas turbines and high-speed light Diesels.

Further development of high efficiency thermionic generators is now practical. Triple-environment vehicles (land, sea and air) utilizing combinations of light metals and new high strength light weight ferrous alloys are possible.

Rapid, "satisfactory" fuel capabilities of using all multi-fuel ranges from high octane gasoline to low grade gas turbine fuels need additional development.

The crux of the problem, according to automotive defense experts, is to keep past gains and consolidate the practical applications of advances now definitely achieved. This must be supplemented by further programs of active research and development.

Since the major automotive manufacturing areas now have the greatest need for defense contracts for such purposes, there is no excuse for diverting future contracts into non-automotive areas where awards have been obtained on the basis of unemployment rosters, or for other reasons not associated with the principal objective of economical, efficient defense vehicle manufacturing, it was emphasized.

BELL'S AIR CUSHION VEHICLE



Powered by 65 hp automobile engine, Bell Aerosystems' 18-ft long 2000 lb experimental craft scoots over ground or water on cushion of air. Bell's ACV is said to be the first such craft licensed for operation on New York roads. It was unveiled last month at boat show in Buffalo, N. Y.

NEWS

CONTINUED

Ford's 401 HP Engine

Timed to coincide with Daytona Speed Week in late February, Ford Div. announced a new 401 hp, 390 cu. in. displacement V-8 engine with triple carburetion. M. L. Katke, general manager of the Engine and Foundry Div., said the new powerplant develops more horsepower per cubic inch of displacement than any other domestic engine now available.

(What became of the AMA resolution to cease the "horsepower race"?).

The new Ford engine features a triple, two-Venturi carburetor system on an aluminum intake manifold. Carburetor linkage is mechanically operated, with the front and rear carburetors acting as secondaries when maximum acceleration is desired.

New Ford Tractors

Ford Tractor and Implement Div. will introduce three new tractors March 23, two industrial models and a farm tractor. The farm model, a five-plow tractor called the "6000," is the largest and heaviest tractor ever built by Ford.

Merritt D. Hill, Ford vice president and general manager of the division, said the new farm tractor cost \$20 million to develop over a five-year period. The "6000" is Ford's first six-cylinder tractor.

All three of the new series will be built in the expanded Highland Park tractor plant. Ford added

290,000 sq ft and 230 additional machines to the renovated plant. Final assembly line has been increased from 3000 to 3400 ft and widened at several points. Carrying capacity has been increased to accommodate the heavy "6000"—6500 lb.

Among the new equipment installed for manufacture of the farm giant is a machining line for a

new planetary gear system, a brake system machining line (the "6000" will have power brakes), and new manufacturing and testing facilities for hydraulic system parts. The tractor has a new hydraulic accumulator system.

New lathes have been added for larger rear axles, and an expanded machining line is being installed for making heavy-duty crankshafts.

CONVERTO ENTERS HEAVY HANDLING FIELD



Converto Mfg. Co., Cambridge City, Ind., has introduced its ConverTrainer System which is claimed to provide a larger payload potential. The truck-mounted hoist employs two hydraulic cylinders, acting on side-mounted arms. The arms swing back, where suspended chains are attached to a container. The container is then swung aboard a flat deck, which is part of the hoist. All actions, including dumping, are handled by the two cylinders.

NEWS

CONTINUED

Goodyear Profits Dip

Net income of the Goodyear Tire and Rubber Co. for 1960 amounted to \$71 million, or \$2.10 a share, second highest in the company's history, compared with \$76 million, or \$2.24 a share, in 1959. Sales declined slightly to \$1,550,940,519 from \$1,579,257,984.

Earnings from foreign subsidiaries totaled \$25.3 million in 1960, compared with \$23.1 million in 1959, despite expropriation of Goodyear's Cuban plant.

Capital expenditures last year were \$74.5 million, against \$55.6 million in 1959. Working capital increased during the year to \$521.5 million from \$510.3 million.

U. S. Rubber Sales Off

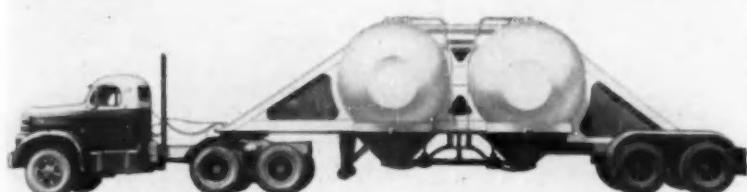
U. S. Rubber Co. sales in 1960 declined one per cent while net income dropped 13.6 per cent. Net sales totaled \$966.8 million, compared with \$976.7 million in 1959. Net income was \$30.7 million,

equivalent to \$4.45 a share compared with \$35.5 million or \$5.30 a share in 1959. U. S. Rubber absorbed a net loss of \$2.1 million, or 37 cents a share, when it wrote off plants seized by the Cuban government. Long term debts were reduced from \$159.9 million to \$154.6 million and net working capital at year's end was \$318.2 million compared with \$312.2 million at the end of 1959.

Autolite Net Down

Electric Autolite Co. net sales for 1960 were \$221.8 million as compared with \$220.7 million in 1959. Earnings amounted to \$6 million, or \$4.05 a share. Earnings in 1959 were \$7.6 million, equivalent to \$4.40 a share. Sales and earnings figures for 1959 and 1960 include, on a pooling of interest basis, operations of the Marshalltown Mfg. Co. and Hiller Aircraft Corp. acquired during the fourth quarter of 1960.

REVOLUTIONARY DRY-BULK TRUCK-TRAILER



New Highway-Interconsult transporter for chemicals, flour, or sand has advanced pneumatic unloading system. The spherical-shaped vessels are made in 300, 340 and 400 cu ft sizes. Trailers provide capacities up to 80,000 lbs.



PAUL WOOTON DIES; CAPITAL REPORTER

Paul Wooton, 79, a member of the Editorial Board of the Chilton Publications and Washington correspondent for the New Orleans Times-Picayune since 1914, died Feb. 16.

Mr. Wooton, who had an uncanny memory for names, held the highest offices in several newsmen's organizations such as the National Press Club, Gridiron Club and the White House Correspondents Association.

For many years he managed the annual White House correspondents' dinners and press receptions for visiting foreign dignitaries.

Mr. Wooton began his reportorial career by writing mining news in Mexico in 1906. When he moved to New Orleans he also represented two Chilton publications, Motor Age and Commercial Car Journal.

Transferred to Washington, he later was made bureau chief for McGraw-Hill Publications. In 1945 Mr. Wooton became a member of the Chilton Editorial Board.

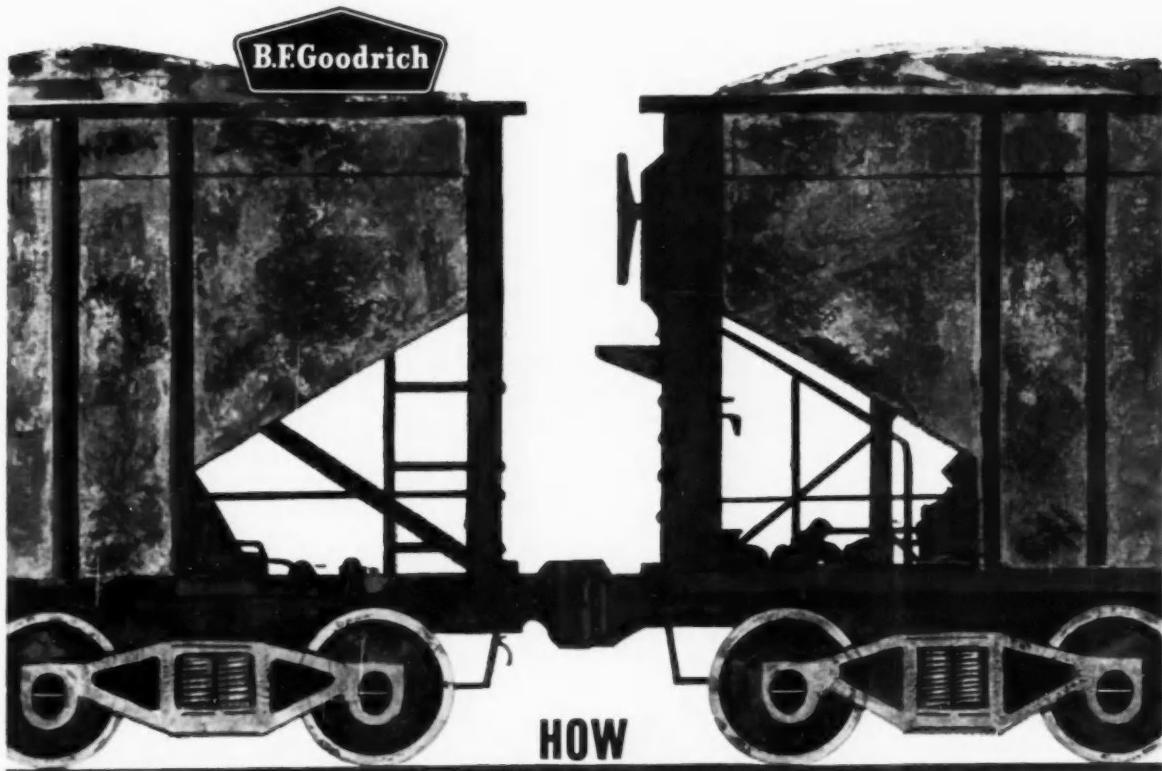
He was a co-founder and former president of the Society of Business Magazine Editors. When his term expired he was made chairman of the Society's Executive Committee. He was executive vice president when he died.

At his death Mr. Wooton also was correspondent for Dun's Review and Modern Industry.

Vertol 'Copter Wins

The Navy has announced the winner of a recently conducted competition for an assault transport helicopter to be the Vertol Div. of Boeing Airplane Co.

This tandem-rotor system helicopter will be powered by twin General Electric T-58-8 turbine engines. It will have all-weather and shipboard capabilities, and is intended to fulfill the Navy requirement for a troop and cargo vehicle for use by the Marine Corps.

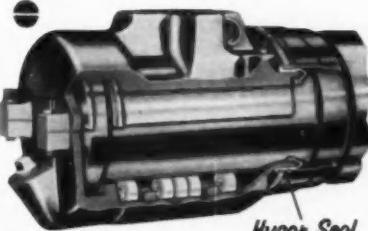


Clevite sealed sleeve cartridges using an oil seal of Hycar are manufactured by Cleveland Graphite Bronze division of Clevite Corporation, Cleveland, Ohio. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber for molding into seals.

HYCAR PUTS A SEAL ON “HOT BOX” ELIMINATOR

Inspection of the working parts of this sealed sleeve bearing cartridge is necessary just once every nine years, according to the manufacturer. Beyond this, the only maintenance needed to assure against freight car “hot boxes” is an annual check of oil levels. Fitted against the journal inside the housing is a positive oil seal made of Hycar nitrile rubber which permanently retains the lubricant.

The manufacturer says, “Without question, there isn’t a seal that compares with this one.” He’s referring to the outstanding resistance to abrasion, to oils and



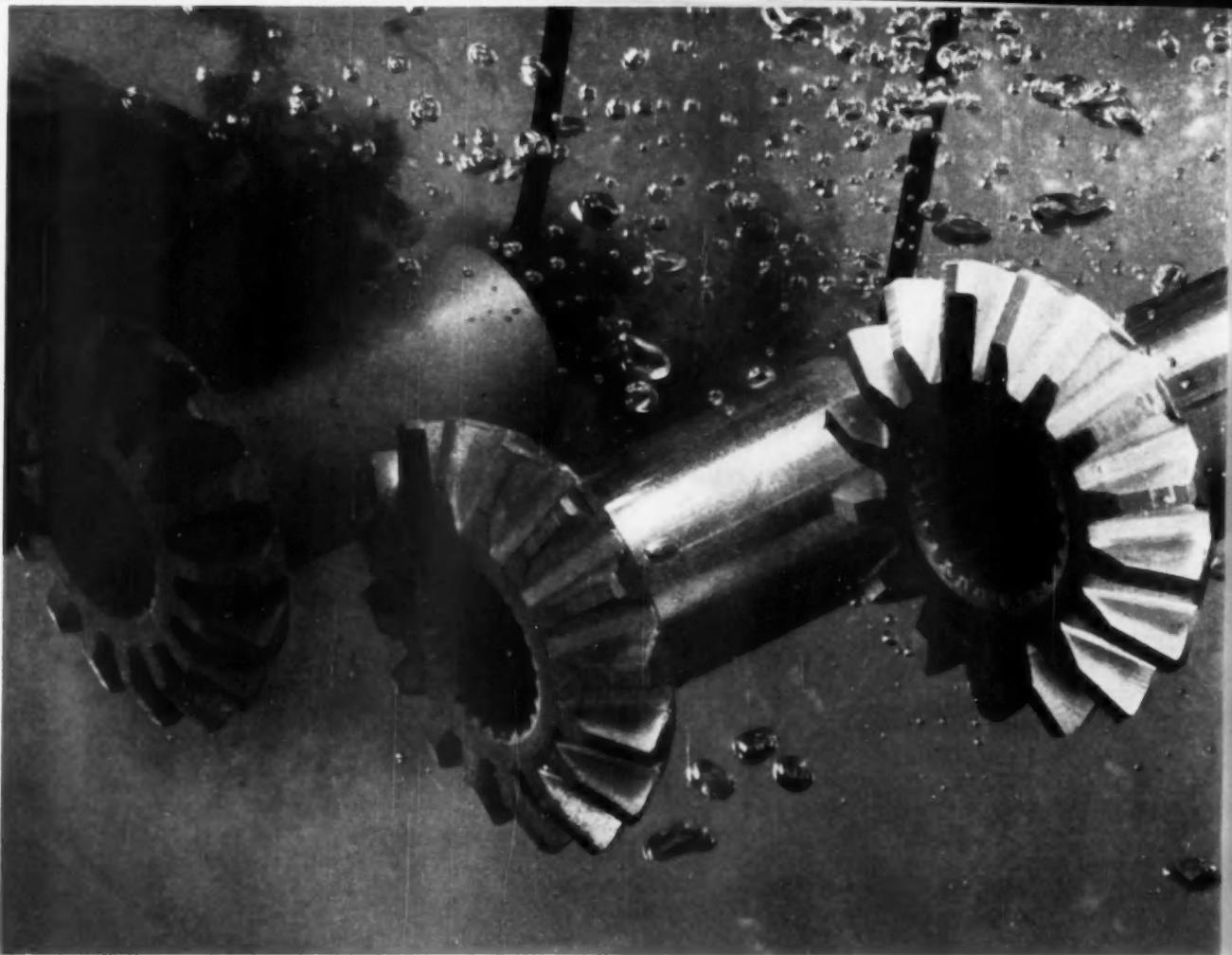
other hydrocarbons and to heat offered by Hycar. Years of service under these tough conditions won’t affect the resilience or effectiveness of these seals. The properties of Hycar solve a tough molding problem, too.

Here’s another example of how Hycar improves present products, sometimes makes possible entirely new products for new markets. Can Hycar help solve your problem? Write for information—Department MK-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

Hycar
Hy-Car Corp.
Rubber and Latex

B.F.Goodrich Chemical Company

a division of The B.F.Goodrich Company



NEW SAFETY SOLVENT permits on-the-line cold degreasing . . . 100% parts inspection

FAR GREATER SAFETY than most other chlorinated solvents makes Chlorothene® NU specially inhibited 1,1,1-trichloroethane ideal for the cold removal of greases, waxes, tars, and oils. In cleaning for spot inspection of close tolerances, or for 100% inspection as on broaching machine operations, Chlorothene NU may be used quickly and safely by spray, dip, bucket or wiping methods. Die parts may be cleaned in the shop without having to send them out for vapor degreasing.

By providing answers to both of the chief hazards of common cold-degreasing solvents, Chlorothene NU is leading a breakthrough in solvent cleaning. Having no fire or flash point measurable by standard methods, it is removed from the flammable class of cleaning compounds. Maximum allowable vapor concentration of Chlorothene NU sol-

vent is a high 500 ppm, compared to carbon tetrachloride at 25. Chlorothene NU is easily recovered by distillation. It can be used safely on most electric motors, instruments, bearings, and on all common metals including aluminum, zinc, corrosion-prone "white-metal" alloys, and on many plastics.

HYDRAULIC FLUIDS continue to be important objects of research at the Dow Automotive Chemicals Laboratory. They are custom engineered, and Dow's broad background in polyols, glycols, and glycol ethers assures hydraulic fluids of the highest quality, and with an almost limitless range of properties.

VORACEL® foamed-in-place rigid urethane offers new advantages for sound deadening, insulating, "pocket" sealing, and strengthening between structural members. The new process

gives a superior, and economically feasible covering and filling material for many automotive uses. For additional information, contact your nearest Dow sales office.

DOW AUTOMOTIVE CHEMICALS LABORATORY

Created expressly to serve the needs of the automotive industry, Dow's Automotive Chemicals Laboratory is active in technical service and development. This laboratory is continually researching and developing coolants, hydraulic fluids, cutting and grinding fluids, function fluids, fuel and lubricant additives, and synthetic lubricants. To see how this laboratory can be of assistance to you, contact your nearest Dow sales office or write Chemicals Merchandising in Midland.

THE DOW CHEMICAL COMPANY



Midland, Michigan

Circle 111 on Inquiry Card for more data

NEWS

FEATURES

B-W to Spend \$40 Million Search Pushed for New Auto Products

Borg-Warner Corp. is in the midst of a large-scale program to expand its automotive business in this country and overseas. At least one or two innovations will find their way into 1962 model cars, according to officials.

Robert S. Ingersoll, the company's president, listed some items now in late testing stages.

They include a low-cost fuel injection system, a spin-resistant differential, a hydraulic retarder for trucks and new automatic transmissions for trucks and buses.

Like many other companies, B-W began a far-reaching diversification program a few years ago.

In addition to auto parts, the company now produces a wide variety of items, including air conditioning and refrigeration equipment, household appliances, farm implement parts, steel, plastics, oil well tools, pumps, plumbing-ware, aircraft and missile parts and building materials.

Good Future Seen

The field of auto development is obviously still one of the company's major interests. The officials see a good future in the field despite its fiercely competitive nature.

To meet competition not only from other auto supply firms but from the car manufacturers, themselves, who produce many of their own parts, Borg-Warner has embarked on a huge program to develop new products and improve existing facilities.

The firm recently completed a multi-million-dollar research center in Des Plaines, Ill., a Chicago suburb. In addition, each division and subsidiary of Borg-Warner maintains its own research and development facilities.

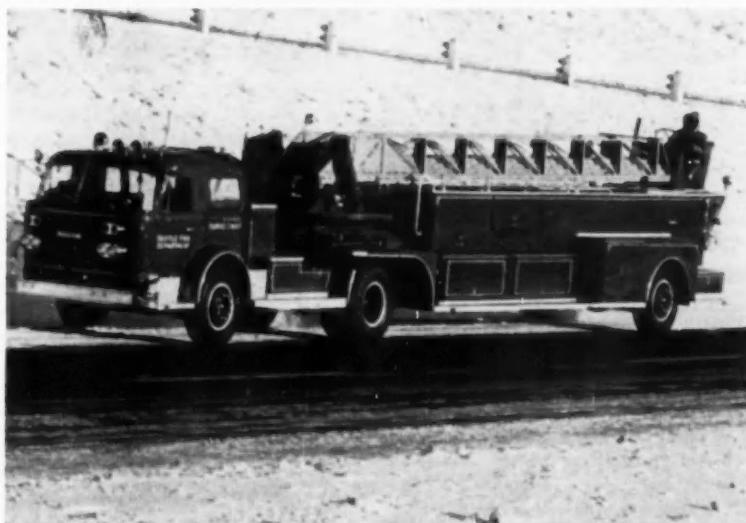
Last year, despite a drop in sales from 1959, the company budgeted the biggest capital expenditure program in its history.

By November, Borg-Warner plans to spend between \$38 and \$40 million on plant expansion in the United States and overseas, new equipment and development of new products.

About one-third of the current budget is allocated for the auto

(Turn to page 21, please)

WORLD'S FIRST TURBINE-POWERED AERIAL LADDER TRUCK



The Seattle, Wash., Fire Department has accepted delivery of American LaFrance's Turbo Chief. From a standing start, it can accelerate to 50 mph in 31 seconds. It is powered by Boeing 330 hp gas turbine engine.

A.I. TABLOID

Latest addition to the growing fleet of plastic boats is a custom made 54-ft cabin cruiser of polyester - fiberglass construction launched in Italy.

Cash dividend payments by corporations issuing public reports amounted to \$13.5 billion in 1960, compared with \$13 billion in 1959. The Office of Business Economics, U. S. Dept. of Commerce, announced December payments were \$2.5 billion, a slight increase over 1959.

Prefabricated steel panels can be assembled into side-walls in the field to build cheaply, extensions to office buildings, warehouses, schools, etc. They are pre-painted.

A new light weight fuel cell consumes hydrogen, bromine and water to generate electric power in satellites and is rechargeable by solar energy.

Shipments of complete civilian aircraft amounted to 2 million lb in November, 1960, according to the Bureau of the Census, U. S. Dept. of Commerce, and the Federal Aviation Agency. During the month, 630 planes valued at \$88 million were shipped.

The average age of automobiles in use today is 5.77 years. An estimated 24 million or 46 per cent of the nation's cars are more than six years old.

Manufacturers' shipments of passenger car tires during November amounted to 7.3 million units. This was a decrease of 16 per cent below the 8.7 million tires shipped during October, according to the Rubber Manufacturers Association, Inc.

Brazil is the largest U. S. motor vehicle export market. The South American country bought 46,600 vehicles last year, of which 43,000 were trucks.

The ratio of coating thickness to wire diameter and the wire's cooling cycle has proved to be one of the most important factors affecting the flexibility of various wire coatings, a three-year Air Force study reveals.

Ways to improve and extend the application of broaching to high temperature alloys are explained in a study compiled by the Air Force and released to industry and the public by the Office of Technical Services, Business and Defense Services Administration, U. S. Dept. of Commerce. The study covers broach cutting and tool life, materials and surfaces, as well as economic and design factors and current developments in the industry.

Motor vehicle travel in the U. S. in 1959 totaled 700.5 billion vehicle-miles, an increase of five per cent over 1958. Total travel for 1960 is estimated at 720 billion vehicle-miles, a three per cent increase over 1959.

An increasing demand in 1961 for ferrous castings is expected by the U. S. Dept. of Commerce. Shipments increased substantially in the first half of 1960, but cutbacks in deliveries resulted in less favorable third and fourth quarters.

Nearly six million trucks, or 51.7 per cent of those in operation today, are less than eight years old. The average age of trucks is 7.6 years.

Sales of scientific and industrial instruments are expected to increase in 1961 substantially over the \$4.5 billion estimated for 1960. Increased sales are expected to rise because of the increased use of on-stream analysis and control devices and computer-controlled process systems; and the increased pace of automation in the chemical, petroleum, and food and beverage industries.

SAE Automobile Week

Automobile industry executives and engineers will gather in Detroit's Sheraton-Cadillac Hotel March 13-17 to discuss technological advances which will have important influences on the industry's future. The Society of Automotive Engineers will sponsor the meetings.

Fifty-nine technical papers will be presented. Dr. R. J. Lund, assistant technical director of Battelle Memorial Institute, will be the featured speaker at the March 16 luncheon. His topic: "The 10-Year Outlook for Metals."

Planned by the combined efforts of the SAE Passenger Car, Body, Engineering Materials, and Production Activities, the week will include sessions on car assembly operations; suspension joints that require no service lubrication; power-operated body mechanisms; discussion of the drivelines of several 1961 models; means of combating corrosion and designing, material selection and operation of piston rings and bores.

4 Caracas Plants

Manufacturers of Volkswagen, Fiat, Renault and the Japanese Nissam are reportedly planning to establish assembly plants in Caracas, Venezuela.

All automobile manufacturers have been told by the Venezuelan government they must establish local plants or have their import quotas canceled.

General Motors and Chrysler have plants in Caracas and Ford Motor Co. has announced it will build a plant there.

Last October, in order to save dollars, the importation of "luxury" cars was prohibited. Banned were Cadillacs, larger models of Oldsmobile and Buick, and other expensive models.

NEWS FEATURES

CONTINUED

(Continued from page 19)
business, according to Albert Steg, vice president and treasurer.

Like many other U. S. companies, Borg-Warner is carefully appraising markets in Europe, Australia and Latin America.

Most of the firm's attention, at present, is focused on the new products under development.

PUSH FUEL INJECTION

"Fuel injection is one of the most exciting new items we are working on at the moment," said Lester G. Porter, executive vice president. "Actually, although it has not been publicized, we have been running fuel injection on test cars for the last three years. We are now finalizing design for production."

Borg - Warner's spin-resistant

differential, manufactured by the Warner Automotive Div., has been used by American Motors Corp. on its Rambler for the last three years. Warner is now working on a design suitable for heavier cars.

In the truck and bus field, Borg-Warner's Long Mfg. Div. has brought out a retarder device which slows down a vehicle on a steep grade without requiring down-shifting or use of brakes.

The retarder, developed over a period of six years, is now undergoing tests by several truck manufacturers and truck fleet owners, Mr. Porter said.

AVAILABLE FOR MARKET

"Thus far, all tests have been good," he said. "It is now available for the market, and limited sales have already been made.

Borg-Warner is hopeful about its prospects."

Other new developments in the truck field include a three-speed and a six-speed automatic transmission, which are now being put to rugged weather and terrain tests, and a hydrostatic transmission for industrial trucks, farm tractors and off-highway vehicles.

Mr. Porter noted that American auto companies are interested in a new light Borg-Warner transmission, suitable for compact cars. But he would not disclose whether any U. S. firm has actually signed to take the unit.

USE MORE PLASTIC

Plastics, a relative newcomer to the family of Borg-Warner products, is finding increased use in automotive applications. The entrant is CYCOLAC, a multi-purpose thermoplastic developed by B-W's Marbon Chemical Div.

With such properties as toughness, scuff-resistance, high heat resistance and light weight, the plastic has been found remarkably suited for many applications. It has been used to replace chrome plated die castings, as arm rest assemblies, air conditioner ducts, electrical harness connectors, instrument controls and as a reinforcing modifier for crash dash material.

NELSON IS ELECTED

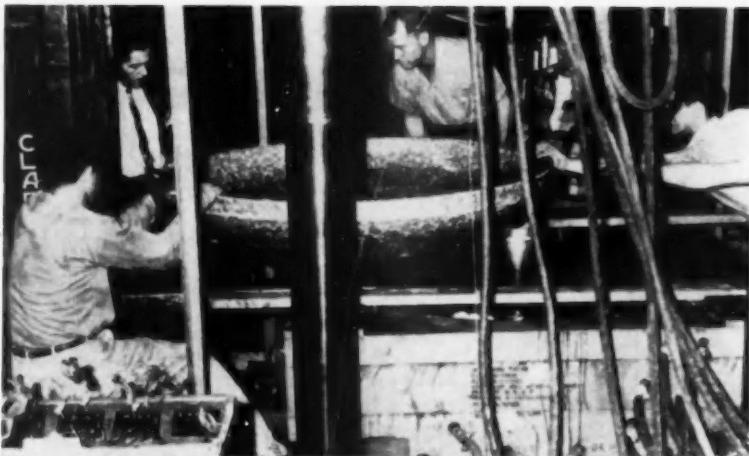
Robert Nelson, manager, Product Support Publications, Large Jet Engine Department, General Electric Co., Evendale, O., has been elected chairman, Service Publications Committee, Aerospace Industries Association.

NEW PACEMAKER SCRAPER



Series L-28 by R. G. LeTourneau, Inc., has 30-ton capacity and is self-loading in many applications. It has a 420 hp Diesel-electric power plant and four individually powered electric wheels for propulsion.

LARGEST PLASTIC MOLDING



Aft closure insulation for first-stage Minuteman ICBM engine is pulled from die after being compression molded. The 400-lb, 60 in. "dish" was produced in one piece by Dumont Mfg. Corp., San Rafael, Calif.

Transmission Output

Production of three-speed automatic transmissions at Chrysler Corp.'s Kokomo, Ind., transmission plant is near the 2,250,000 mark, W. L. Miron, plant manager, has announced.

Pilot production of this company's three-speed automatic transmission for eight-cylinder engines was started in November, 1955, at Kokomo.

In September, 1959, the Kokomo plant added new Torque-Flite-six transmissions to the Torque-Flite-eight units produced at the plant.

Chrysler has produced more than 5,400,000 automatic transmissions since it first introduced the two-speed PowerFlite on 1954 models. All Chrysler-built automatic transmissions have been produced in Chrysler's Indiana plants.

New Two-Ply Tire

A two-ply tire claimed to have the same carcass strength as standard four-ply tires has been developed by the B. F. Goodrich Co. for use on compact cars.

E. F. Tomlinson, president of B. F. Goodrich Tire Co., a division, said the new tire is lighter in weight, softer riding and cooler running than present tires for

compacts and is equal to the four-ply tire in strength, endurance and tread wear.

"While the new tire has only two layers of Tyrex rayon cord in the tire body, its cords are much larger and stronger than those used in conventional tires," Mr. Tomlinson explained. "In fact, we use as many pounds of Tyrex in the two-ply tire as in the four-ply. Tire strength is directly related to the quality and weight of cords used," Mr. Tomlinson said.

Comet Output in N. J.

Production of Comets will be added to the Ford Motor Co. assembly plant in Metuchen, N. J., this month, Ben D. Mills, general manager of the Lincoln-Mercury Div., has announced.

The first Comet assemblies are scheduled to begin at Metuchen during the week of March 6. The plant now assembles Falcons. These operations will continue.

"Utilization of the Metuchen plant for the Comet will provide an East Coast assembly location for a second Lincoln-Mercury Div. car line both this year and next," Mr. Mills said. "The 1962 Mercury again will be assembled at the Mahwah, N. J., plant, as are the current models," he added.

Economy Puzzle

A puzzle for market analysts has been the word "economy" — how much economy does the owner of an economy car really want? One answer: economy is relative; it means different things to different people.

Take the buyers of the Buick Special, for instance. The Special, compared to other cars in the Buick line, is an economy car. Yet Buick reports that most of the Specials sold are deluxe models equipped with extra-cost options of automatic transmission, radio, heater and whitewall tires. Power steering goes on more than 21 per cent of the Specials, adding to the cost.

New Impala Model

Chevrolet has given a new meaning to the once-dreaded "SS" symbol. Chevy is using the monogram on a new "Super Sport" version of the Impala.

The new sports models have a special emblem on the rear deck lid and rear quarter panels, with a red "SS" superimposed. The Impala SS models include power brakes and steering, heavy-duty front and rear springs and shock absorbers, sintered metallic brake linings, and a tachometer mounted on the steering column.

2 Ford Contracts

Ford Div. of Ford Motor Co. has been awarded two large government contracts.

On the heels of a \$3.5 million order for 923 buses is an Ordnance Tank Automotive Command contract calling for 922 station wagons. Nine Ford assembly plants will share in the \$1,623,406 contract to furnish 831 nine-passenger country sedans and 91 four-door ranch wagons for the Air Force, Army and Navy.

NEWS

FEATURES

CONTINUED

New Cessna 'Skywagon'

Responding to demand for a multi-mission utility aircraft, Cessna has unveiled a new six-place, single-engine series dubbed the Model 185. Powered by a Continental 260 hp engine with fuel injection, it will carry six adults plus 270 lb of extra weight with full fuel at speeds up to 172 mph. Top speed is 176 mph, gross weight 3200 lb and empty weight 1520 lb.

The "Skywagon" is certified for both floats and skis. The $\frac{3}{4}$ in. spring steel landing gear is standard with a choice of 6.00 x 6 or 8.00 x 6 wheels and brakes, with six-ply tires and a 10 in. tail wheel.

Five different seating arrangements are available: (1) the standard pilot seat only utility version, (2) co-pilot seat, (3) six-place high density version, (4) four-place version, and (5) four-place version with deluxe upholstery and fabrics.

With initial deliveries expected in March, 1961, the Model 185 is priced at \$18,950, f a f Wichita for the standard equipped series.

Shift to Corvairs

Chevrolet has converted its Oakland, Calif., plant to exclusive production of Corvairs earlier than originally planned.

The Oakland plant has been producing both Corvairs and Chevrolets. Edward N. Cole, general manager, said the West Coast demand for Corvairs caused the speed-up in plans. Corvairs, he said, are running better than 30 per cent of Chevrolet passenger car sales.

Chevrolets will continue to be built at the Van Nuys, Calif., plant and at a new plant in Fremont to be erected next year.

BRITISH PLANE WOULD REPLACE DC-3



Hawker Siddeley's Avro 748, which recently made its first flight, is a pressurized low-wing turboprop aimed at the DC-3 replacement market. Powered by two Rolls-Royce Darts, it carries 40 passengers with a payload of 9666 lb, and cruises at 265 mph. It is 67 ft long and has wing span of 95 ft.

Jets' Aerial Brake

An aerial brake that uses jet engine thrust in reverse has been developed by a Republic Aviation Corp. engineer.

The device, operated by the pilot, is claimed to make possible shorter landing rolls, and, in the case of multi-engine planes, the "sharpest possible turns" whether steering on ground or on water.

Its designer, Henry E. Arnzen, senior engineer in design safety and reliability for Republic, said this brake offers "a significant safety factor by enabling the pilot to have on hand full standby power for emergencies." He explained that, because it can divert jet thrust during landings, the engine would not have to be throttled down and thus, in an emergency, the pilot can quickly close the reverse-thrust channel and instantly regain full power.

The apparatus can be retracted fully within the aircraft during normal flight, eliminating one of the principal shortcomings of earlier reverse-thrust braking de-

vices, Mr. Arnzen said. He also pointed out that the movable "doors" which constitute the mechanism for reversing the direction of thrust are built into the jet engine housing or tail pipe. Up to 70 per cent of the thrust developed can be diverted to act as a brake, he said.

Mr. Arnzen said use of the system could markedly reduce the length of runway required for high-speed landings. Conventional speed brakes, flaps and wheel brakes have proven "inadequate" for this job, he added.

Corrosion Discussed

Problems relating to automotive corrosion were discussed by members of the Society of Automotive Engineers Buffalo Section at a meeting in Williamsville, N. Y.

Speakers were James B. Hill, Application Development Dept., Allegheny Ludlum Steel Corp., and James E. Zane, market development engineer, American Zinc Institute.

AT BCA everything's new but the name



BALL BEARING "HEARTBEATS"

checked with unique new fatigue tester

With a stethoscope checking the "heartbeats," this unique fatigue tester is putting BCA ball bearings through a battery of exaggerated, but controlled, speed and load tests.

The fatigue testing machines are part of a group of testing devices that provide essential data for BCA's research program. Hydraulically testing BCA bearings at a variety of rotational speeds and under many combinations of radial and thrust loads, each machine checks to see that BCA ball bearings are maintaining the highest fatigue life standards . . . evaluates the fatigue characteristics of new ball bearing materials and new processing methods . . . helps select ball bearing lubricants to provide the longest possible fatigue life.

These machines and BCA's other unusual testing devices are

designed and built to help us develop the highest quality ball bearings available. By simulating actual operating conditions, BCA ball bearings can be tested to exceed customer specifications.

BCA ball bearings are standard equipment throughout industry—for both original and replacement applications. BCA's complete line of ball bearing types and sizes . . . design, engineering and manufacturing skill . . . plus research and testing facilities, are some of the reasons that automotive, machine tool, earth moving, agricultural equipment manufacturers specify BCA. We'd like to serve you—with high-performance bearings or technical assistance. Contact Bearings Company of America, Division of Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.



**BEARINGS COMPANY
OF AMERICA**

ball
bearings

DIVISION OF
FEDERAL-MOGUL-BOWER
BEARINGS, INC.

MEN IN THE NEWS



Goodyear Tire & Rubber Co., Foam Products Div.—Frank R. Evans has been promoted to general manager.



Dura Corp., Motor State Products Div.—Donald E. Bradeur has been promoted to assistant manager.



H. K. Porter Co., Inc., Coldform Div.—Charles L. Peters has been appointed general manager.



Electric Autolite Co.—George A. Dauphinais has been appointed vice president and assistant to the president.



Ford Motor Co.—Will Scott has been promoted to executive director of central product planning office.



Stewart-Warner Corp.—**Ernest N. Robinson**, general manager of the Alemite and Instrument Div., has been elected a vice president.

ACF Industries, Inc.—**Carol A. Mundt** has been named director of industrial relations.

General Motors Corp., Inland Mfg. Div.—**Leslie C. Wolcott** has been named general manager to replace **John D. O'Brien**, who has retired.

Chrysler Corp., Dodge Div.—**Charles W. Kelley** has been promoted to manager of product engineering.

Champion Spark Plug Co.—**Ross E. Nielsen** has been named assistant manager of the automotive technical services department.

Ex-Cell-O Corp., Precision Parts Div.—**Roland T. Volker** has been promoted to assistant sales manager.

E. W. Bliss Co.—**Joseph Hauf** has been promoted to technical director-engineering.

Crucible Steel Co. of America—**W. E. Gregg** has been appointed vice president-operations.

Flexonics Corp.—**Lloyd G. Fox** has been appointed vice president and director of marketing.

General Motors Corp., Guide Lamp Div.—**W. Gene McMahan** has been transferred to head of plastics section of tool engineering.

Ford Motor Co., Ford Div.—**Robert J. Eggert** has been named marketing research director.

General Motors Corp., Buick-Oldsmobile-Pontiac Div.—**Richard G. Carter** has been promoted to director of tool and process engineering.

Ford Motor Co.—**Robert R. Cosner** has been named plant manager of chassis parts plant in Sterling township, Mich.

Electric Autolite Co.—**Robert O. Boden** has been named plant manager at Decatur, Ala.

General Motors Corp., Delco-Remy Div.—**Perry W. House** has been promoted to works manager.

Colorado Fuel and Iron Corp.—**Morton J. Reynolds** has been named superintendent of South San Francisco plant.

Dana Corp.—**J. R. Miller** has been appointed group vice president in charge of manufacturing, engineering and industrial relations.

American Steel Foundries—**Ralph D. Brizzolara**, vice president, has retired after 41 years' service.

Chrysler Corp.—**William F. Grimmsman** has been promoted to comptroller of Twinsburg stamping plant.

General Motors Corp.—**Carl H. Kindl**, vice president and group executive in charge of overseas and Canadian operations, has retired.

Diamond T Motor Truck Co.—**Joseph L. Krickl**, assistant to the president, has retired after 44 years.

Youngstown Sheet and Tube Co.—**William F. Rehn** has been promoted to assistant superintendent of the cold strip mill at the Campbell Works.

Necrology

Fred T. Boswell, 66, chief of repair parts and engineer branch of the Army Ordnance Corps in Detroit, died Feb. 12 in Detroit.

Robert J. Aitchison, former president and chairman of Fansteel Metallurgical Corp., died Feb. 5 in Evanston, Ill.

Louis B. Forman, 48, chief engineer in product engineering for the Chrysler missile plant, died Feb. 4 in Mobile, Ala.

Walter D. Hunter, 66, aeronautical engineering director of the deHavilland Aircraft Co. of Canada, Ltd., died Feb. 3 in Toronto.

Reinhold C. Koepke, 58, former director of quality control for the Fisher Body Div. of General Motors Corp., died Jan. 30 in Royal Oak, Mich.

Roger N. Heald, 64, former president and chairman of the Heald Machine Co., died Jan. 25 in Worcester, Mass.

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.

When Should Alloy Steels Be Ordered to Hardenability?

What is hardenability and how does it differ in carbon and alloy steels?

Hardenability can be defined as the capacity of steel to develop a desired degree of hardness, usually measured in depth. It is produced by special heating and cooling. Carbon steel, except in small sections, will normally harden to a depth slightly below its surface, while alloy steel can, under certain conditions, harden uniformly through its entire cross-section.

Surface hardness obtainable after quenching is largely a function of the carbon content of the steel. Depth hardness, on the other hand, is the result of alloying elements and grain size, in addition to the carbon present in the steel.

In general, where hardenability is the prime consideration, it is not too important which alloy steel is used, just so long as there is sufficient carbon present to give the

prescribed hardness, and there are enough alloying elements to quench out the section. It is not considered good practice to alloy a small section excessively, since excessive use of alloying elements adds little to the properties and can, in some instances, induce susceptibility to quenching cracks.

There are, of course, numerous cases where factors other than hardenability must be considered; such factors as low-temperature impact, heavy shock, creep-resistance, and the ability to resist temper brittleness. Through-hardenning, therefore, is not always desirable. For example, shallow hardening is often necessary in shock applications, because a moderately soft core is essential.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.



for Strength
... Economy
... Eye-Appeal

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



an Editorial

Buying "Quality" is Now Foremost



ALMOST ALL MAJOR PLANTS throughout the automotive industries have installed new systems of "total quality control" or "reliability control." Last month the automotive division of the American Society for Quality Control presented technical lectures during its annual conference in which many of the most important new aspects of these subjects were described. A new 20 minute technicolor motion picture entitled "A Matter of Responsibility" demonstrated how this intensive search of automotive men for maximum reliability is being advanced in typical plants. During plant visits in other manufacturing facilities, it was apparent that the importance of quality and reliability is now being stressed more than ever before.

SINCE JANUARY 1, there have been a series of vendor conferences within individual divisions throughout the industry. In these the manufacturing, design and purchasing executives have shown suppliers what is demanded under these new programs. It seems quite evident that no item is too small to escape this close scrutiny and no item is too big to evade these requirements for improvement. Indeed, there has been no previous period in the history of the industry when so many production, design and manufacturing engineers and purchasing agents were looking as carefully at as many aspects of as many items as those which are being studied now.

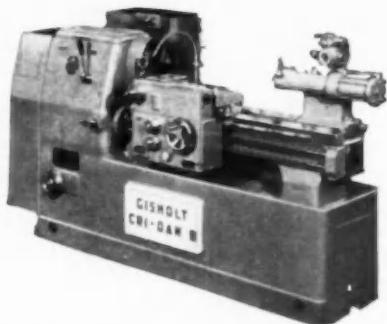
SUCCESS IN ATTAINING THE NEW GOALS is a joint responsibility of the automotive industries and their suppliers. The new environment of intensive cooperation points toward an ever increasing scale of cooperative effort. But it also means that some changes in traditional patterns of buying, specification, manufacturing and design will appear in an ever increasing tide. Just as the vehicle manufacturers compete for the satisfaction of more of the needs of more of their own customers, so also the vendor and supplier must compete to provide more "reliability" attributes in their products and services. Vendors who have important advantages in quality now seem to have marketing advantages over producers who do not cooperate with the industry in these functions.

IN BRIEF, THERE IS MUCH to be gained by every supplier who anticipates the effect of the new quality control and reliability systems on his own business. For those who have not become aware of these techniques, AI has prepared an elaborate 65 page technical manual on automotive "Reliability" systems available to any recognized vendor. (Price \$2.00) But there is much more to the problem than merely reading the AI technical manual. Each supplier should obtain the valuable "supplier audit reports" now available from some automotive divisions and companies. By using such aids, suppliers prepare themselves for the best possible cooperation with the automotive industries.

Harry W. Barclay

Editor and Publisher

SOMEBODY *is doing it for* LESS



Gisholt CRI-DAN Model B Automatic Threading Lathe—Sets up in 8-15 minutes. Uses inexpensive single-point carbide tools to produce all types of internal and external threads: single- or multiple-start, coarse or fine, left- or right-hand, straight or tapered, standard or special form—in any material, including new high-tensile, hard alloys.

Optional accessories for the CRI-DAN B permit you to combine precision threading with tracing, turning, boring and facing cuts in one fast, automatic cycle. Other models are available. Call your Gisholt Representative or write for Catalog 1215.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers® • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantees

While others are saving 30% to 80% with a new but proved threading technique, can you afford to stay with conventional methods?

With a Gisholt CRI-DAN High-Speed Threading Lathe, you can now use inexpensive single-point carbide tools to produce *quality threads—simple or complex—automatically*. A large number of progressive manufacturers (perhaps your toughest competitors) have found that the CRI-DAN technique cuts costs throughout the plant—with *direct savings* in initial costs, reduced threading times and tooling requirements—with *indirect savings* in tool inventory, materials-handling, floor space and planning.

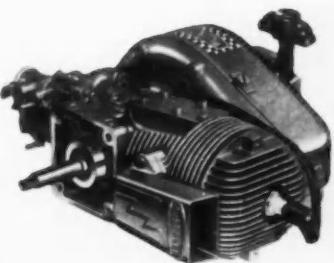
Whether you're threading in lots of 6 or 600, the CRI-DAN technique will permit you to do it for less.



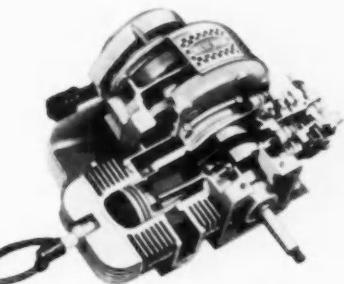
GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.



Typical dual West Bend engine installation on racing kart. Engines are available in clockwise and counter-clockwise rotation versions for dual application.



West Bend's new 580-V5 engine features five-port induction for increased volumetric efficiency. Displacing 5.8 cu in., it is rated 6.5 hp.



Cutaway view of West Bend two-stroke aircooled engine. Cylinder and crankcase structure is a single aluminum die casting.

New Developments in SMALL GASOLINE ENGINES

By
Charles A. Weinert

EASTERN EDITOR

APPLICATIONS of "small" gasoline engines—those having piston displacements of less than 30 cu in.—are numerous both in variety and in overall volume.

These applications include use in electric generating sets, chain saws, lawn mowers, racing karts, scooters, mini-cycles, and in truck-trailer refrigeration. Also in air compressors, liquid pumps, brush cutters, earth compactors, earth drills, garden tractors, concrete mixers, aircraft ground heaters, and other places where a light-weight or easily-portable powered unit is needed.

Broadly speaking, some of the outboard motors and auxiliary inboard engines (see AI of January 15, February 1, and February 15) also are in the "small engine" category. However, for the purposes of this article, the data presented will be centered on "land" applications—since the new marine engines have already been described.

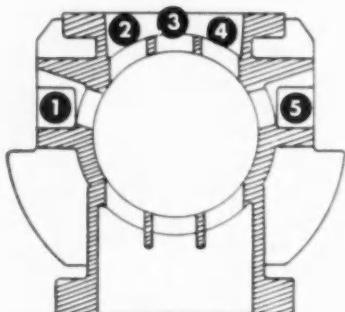
Millions of these "small" gasoline engines are produced annually. Statistics taken from the latest (August 30, 1960) report of the Industry Division, Bureau of the Census, U. S. Department of Commerce, will illustrate this point.

The principal figures being presented here are for the year 1959, and cover gasoline engines (exclusive of outboard, automotive, and aircraft) shipped to users, as well as engines produced and incorporated into end products of the engine makers. Also included are equivalent figures for the year 1958.

Total 1959 gasoline engine shipments are given as 7,179,565—close to 25 per cent above 1958's 5,755,879. The accompanying tables contain numerical break-downs by

number of cylinders (Table I), horsepower rating (Table II), and piston displacement (Table III).

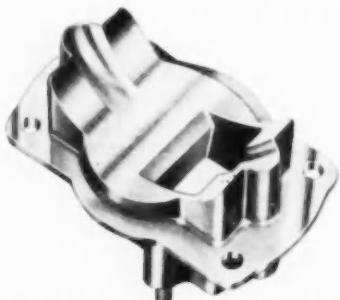
It will be noted that the smaller sizes of engines represent very sizable portions of total gasoline en-



View of West Bend cylinder looking down at top of piston, showing five induction ports. Separate intake passages carry fuel mixture from crankcase to ports 1 and 5. Main intake passage feeds ports 2, 3 and 4.



V-shaped reed valve plate of West Bend engine is designed for smooth fuel-mixture flow. It is die-cast, and has four stainless steel reeds with stops.



Reed valve plate fits into this West Bend crankcase "stuffer" which reduces crankcase volume and thus increases crankcase compression for improved fuel delivery. This part likewise is a die casting, designed for unrestricted fuel-mixture passage into the crankcase.

gines. For example, single-cylinder engine production in 1959 amounted to about 6.7 million in a total of 7.2 million. Engines with ratings under 7 hp are shown as being 6.6 million in the total of 7.2 million. Engines with piston displacements under 11 cu in. amount to 6.3 million, and engines up to and including 30 cu in. amount to 6.7 million—in the total of 7.2 million produced during 1959.

As in most fields, technological progress is being made in the small-engine industry. Recent design developments of three of the small-engine builders are described in the following:

West Bend Aluminum Co.

DEVELOPMENT of this maker's two-stroke engines has been accelerated by the new sport of kart racing. Users in this field—as is the general custom—are asking for more and more power. Yet the power increases must come without increasing engine size, because kart competition is based on piston displacement, also retail price. For example, Class A competition is limited to engines of not more than 5.8 cu in. and not over \$100 list price.

West Bend has met this problem head-on with the introduction of two new models. They are scheduled to go into production late this month or early in April.

Both are two-stroke, single-cylinder aircooled, engines, with weights of 13½ lb.

The 580-V5 has a 2-1/16-in. bore and 1¾-in. stroke. Displacing only 5.8 cu in., it is rated 6.5 hp max at 7000 rpm.

The 700-V5 has a 2¼-in. bore and 1¾-in. stroke, for a piston displacement of 7.0 cu in. At press time, its rated horsepower was still unreleased.

These new engines feature a five-port induction system. A V-shaped reed valve assembly, with four stainless steel reeds, provides "straight-through" fuel-mixture flow from carburetor to crankcase. Three intake passages then carry the fuel mixture from the crankcase to the five intake ports, and the mixture enters the combustion

TABLE I
GASOLINE ENGINES
Except Outboard, Automotive, and Aircraft
Shipments by
NUMBER OF CYLINDERS

No. of Cyls.	1959	1958
1.....	6,708,336	5,351,209
2 and 3.....	101,682	74,593
1, 2 and 3	6,810,018	5,425,802
4	242,097	217,502
6	103,910	101,649
8 and 12.....	23,540	10,926
Totals.....	7,179,565	5,755,879

chamber via the five intake ports. The induction system, from carburetor to combustion chamber, has thus been redesigned for increased volumetric efficiency.

On these engines the cylinder head, cylinder and crankcase are integral, being made of a single aluminum die casting. Cylinder bore is of cast iron, integrally-cast—used "as is" on the 580, chrome-plated on the 700.

The crankshaft is of drop forged steel, mounted on a ball bearing at the drive end and on a roller bearing at the magneto end. Roller bearings are used at both ends of the connecting rod.

A diaphragm-type carburetor with integral fuel pump is used for



The new Clinton EV-1200 is equipped with electric-starting equipment. Rated 4.5 hp at 3600 rpm, it is a single-cylinder four-stroke aircooled unit having a displacement of 10.2 cu in.

TABLE II

GASOLINE ENGINES

Except Outboard, Automotive, and Aircraft

Shipments by**HORSEPOWER RATING**

Horserpower Rating	1959	1958
Under 3 hp.	3,594,840	3,679,168
3.0-3.9		1,178,132
3.0-4.9	2,657,648	—
Under 5 hp.	6,252,488	—
4.0-6.9		378,391
5.0-6.9	336,904	—
Under 7 hp.	6,589,392	5,235,691
7.0-10.9	156,927	126,746
Under 11 hp.	6,746,319	5,362,437
11-15		43,201
11-20	45,910	—
16-30		58,803
21-30	48,521	—
30 hp and under	6,840,750	5,464,441
Over 30 hp.	338,815	291,438
Totals	7,179,565	5,755,879

karting and for other applications where the engine is tilted or vibration is severe. Concentric bowl and automotive-type float carburetors are available for less-exacting applications. Ignition is by flywheel-type magneto.

The engines also are available with either clockwise or counter-clockwise rotation at the drive end.

Karting is not the only application for which the West Bend engines are intended. The new engines, together with the Series 390, 1.6-hp model, are "general-purpose" units.

Clinton Engines Corp.

INCLUDED in this maker's line for 1961 are three new four-stroke aircooled cast-iron engines, a novel ignition system, and a civilian adaptation of a light-weight missile engine.

New engines are the EV-1200, rated 4.5 hp; the 5500 series, rated 5.5 hp; and the 6500 series, rated 6.5 hp. Ratings are at 3600 rpm. Each of these models is a single-cylinder unit.

The 4.5-hp EV-1200 is equipped

TABLE III

GASOLINE ENGINES

Except Outboard, Automotive, and Aircraft

Shipments by**PISTON DISPLACEMENT**

Cu. In.	1959	1958
Under 6 cu. in.	1,005,194	—
6.0-10.9	5,329,758	—
Under 11 cu. in.	6,334,952	5,081,500
11-30 cu. in.	386,169	269,076
Up to 30 cu. in.	6,721,121	5,350,576
Over 30 cu. in.	458,444	405,303
Totals	7,179,565	5,755,879

with electric-starting equipment. Its 12-v electrical system has a starter with gear drive designed for starting temperatures as low as -30 F, and a built-in alternator for battery charging. This engine has a bore of 2-15/32 in. and stroke of 2 1/8 in., for a piston displacement of 10.2 cu in. It weighs 54 lb.

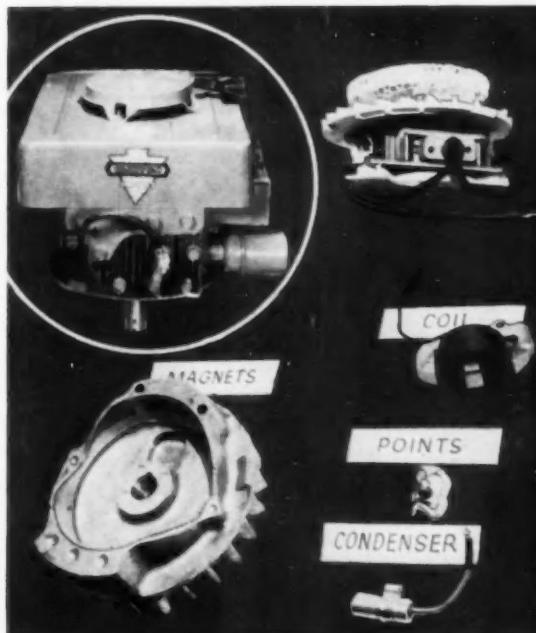
Series 5500 and 6500, rated 5.5 and 6.5 hp, have a bore of 2.75 in. and stroke of 2.375 in., displacing 14.1 cu in. A higher-compression-

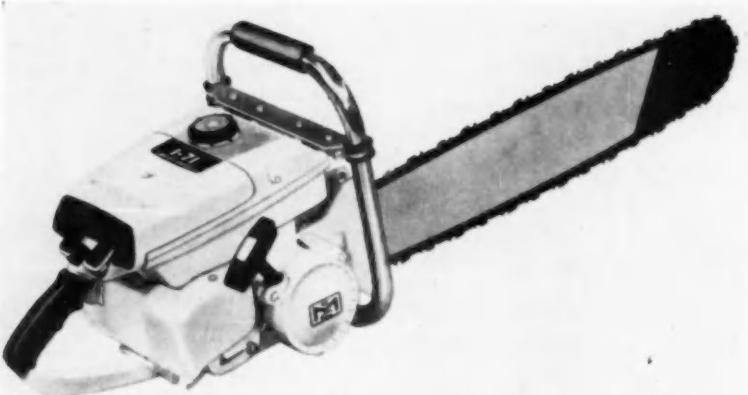
ratio cylinder head is used on the 6500 series to produce the one more horsepower. Both of these engines are available with vertical or horizontal output shafts. Their weights with vertical shafts are 64 lb each; and with horizontal shafts, 66 lb each.

The novel ignition system, called Dynaspark, eliminates the usual magneto, condenser and breaker points. This system was developed by the Cleveland Graphite Bronze Div., Clevite Corp. It will be obtainable on Clinton's Clintalloy series in horsepowers from 2.75 to 6.5.

Replacing the standard ignition parts is a small ceramic crystal which when "squeezed" produces an electrical charge of some 20,000 v (see AI of December 15, 1960, page 67). With a switch and spark plug, along with the crystal and its "squeezing" mechanism, a complete ignition system for a small engine is formed.

Under way is an adaptation of an engine used in the Martin-Lacrosse missile, to applications in the industrial and consumer fields. Delivering 10 hp at 5400 rpm and weighing only 23 lb, it is attractive because of its portability. The 23-lb weight compares with 103 lb for



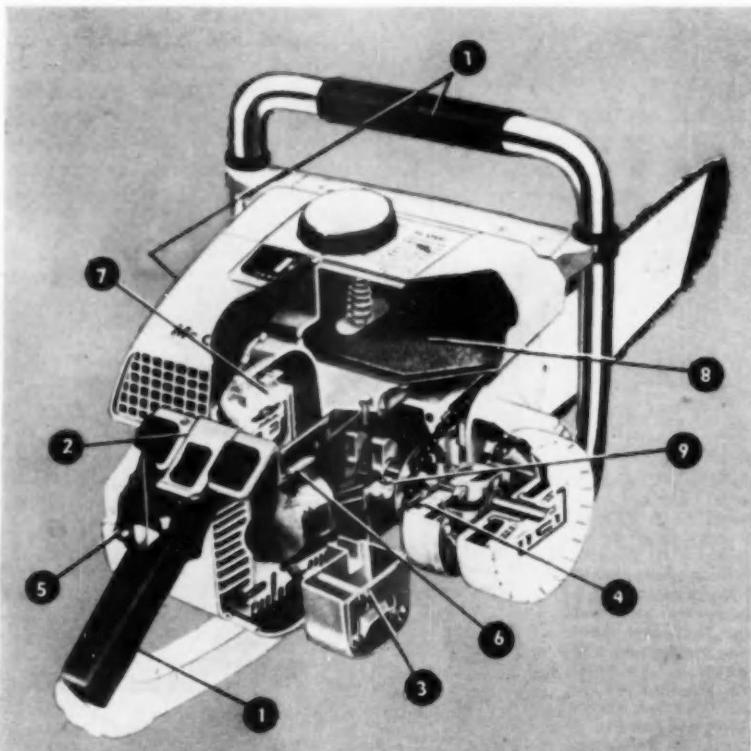


McCulloch's new Model One/71 chain saw is powered by a single-cylinder two-stroke engine of 5.3 cu in. displacement.

a standard four-stroke one-cylinder engine of the same 10 hp.

The missile engine is a two-cylinder, two-stroke aircooled unit, with a bore of 2.125 in. and stroke

of 1.5 in., displacing a total of 10.7 cu in. Government specifications call for this engine to deliver enough output to produce a minimum of 2100 w at 120 v.



Design features of McCulloch's Models One/71 and One/81 power saws include (1) new rubber-padded pistol grip and handlebar; (2) fingertip control of throttle, ignition switch, and choke; (3) muffler with two noise-level settings; (4) automatic rewind starter with clutch; (5) coil enclosed in epoxy resin; (6) third porting and loop-scavenging system; (7) all-position cutting with diaphragm carburetor and felt wick filter; (8) insulated gas tank; and (9) anti-friction bearings.

McCulloch Corp.

As a general rule, the small air-cooled engines built by McCulloch Corp. are integral parts of the power chain saws produced by this company.

Four basic engines are used on the seven different models of saws. All of the engines are single-cylinder, two-stroke, aircooled type. Piston displacements are 3.3, 4.9, 5.3, and 9.8 cu in.

Cylinders are of die-cast aluminum alloy with cast iron liners. Flywheels are die-cast aluminum alloy with integral magneto magnets, steel hub and reinforcing plate.

Crankcase material on the 3.3 and 9.8 cu in. engines is a magnesium alloy die-cast. On the other two models, crankcase material is a die-cast aluminum alloy.

Crankshafts are of drop-forged SAE 1050 or 8620 steel, hardened. Main bearings on some models are two ball bearings; others have one ball and one needle bearing. Connecting rod crankpin bearings are needle bearings on all models. Except for the 3.3-cu-in. engine which has bronze bushings for piston pin bearings, two needle bearings are used in this location.

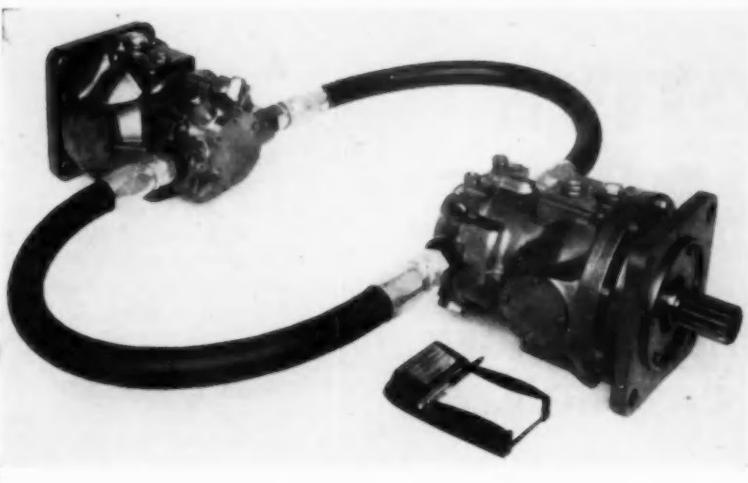
Carburetors are of the diaphragm type on all models; and most models are equipped with a felt wick type fuel filter.

New engineering features on McCulloch's 1961 power saw line are contained in the Models One/71 and One/81. Both of these 16-in.-cutter-bar models have the 5.3-cu-in. engine.

Features include new rubber-padded pistol grips and handlebars, and neoprene mounts between the handlebars and engine. These models have a new muffler with two settings, one for minimum noise level. Gas tanks are insulated.

The pistol-grip handle at the rear of these units has push-button controls. Throttle button is forefinger-actuated, while the oiler, ignition switch, and choke can be actuated by the operator's thumb.

Direct drive to the chain saw is used on the Model One/71. The One/81 has a gear reduction of 3 to 1. Weights are respectively 21 and 25 lb. ■



Pump and motor of a Dynapower hydrostatic transmission. Both are of the axial piston type, and feature almost complete interchangeability of parts.

be used according to the user's desires.

When reversing vehicle direction with a Dynapower transmission, the drive wheel rotation is slowed, stopped, and begun again in the opposite direction with absolute smoothness, at any rate of change desired, and without brakes or clutches.

Present production Dynapower transmissions have been designed for installation as the traction-drive for lift trucks, front end loaders, farm tractors, combines, and other similar off-road vehicles.

Dynapower installations other than traction drives include power steering for heavy road scrapers, drum drives for mobile concrete mixers, and variable speed cooling for drives. ■

New Hydrostatic Transmission for Mobile Equipment

HYDROSTATIC transmissions are now available to mobile equipment manufacturers from the Watertown Division of The New York Air Brake Co.

In its simplest form—say, for use in a fork lift truck—the Dynapower transmission consists of a variable displacement axial piston hydraulic pump which is coupled directly to the vehicle's engine, and a fixed displacement — otherwise similar — hydraulic motor which drives directly into the differential. High pressure hoses connect the pump and motor. The speed and direction of rotation of the hydraulic motor are determined by the position of the pump's variable cam. Other combinations of single and dual, fixed and variable pumps and motors are available for applications having different performance requirements.

Advantages cited for the Dynapower transmission are:

1. Full torque at low engine speeds—even idle
2. Infinitely variable, stepless, speed ratios
3. Elimination of drive line components (clutches, uni-

versals, driveshafts, and gear changers)

4. Service brake usage eliminated
5. Fast, yet smooth response to direction changes
6. Increased vehicle utilization range.

Ability of the transmission to produce full torque at low engine speeds gives the operator a degree of control impossible with any other type of transmission. Tasks requiring maximum torque can be performed at low engine speeds. This eliminates the tendency for the vehicle to run away with itself when the peak torque requirement abruptly disappears. Dynapower's infinitely variable speed ratio is always under the operator's complete control so that the transmission is always working for him.

Brake maintenance will be reduced since the transmission itself can handle all service braking requirements.

Operation of the transmission is by a single control which determines both direction and speed. However, versatility of the transmission allows almost any combination of foot and hand controls to

Carbon Black Credit

The Export-Import Bank has authorized a \$1.4 million credit in favor of the United Carbon Co., of Houston, Tex., for use by its affiliate, United Carbon de Venezuela. Funds from the credit will finance acquisition of U. S. equipment for a new carbon black producing plant in Valencia, Venezuela.

Valencia is the site of three of the four auto tire manufacturing plants in Venezuela. It is expected the tire industry will take the bulk of United Carbon's output.

Tool Group Elects

George Tann, vice president of Congress Tool & Die Div., Tann Corp., has been elected president of the Detroit Tooling Association. Other officers include Howard N. Maynard, president of Snyder Corp., vice president, and Wendell G. Mouw, president of Royal Oak Tool & Machine Co., treasurer.

AUTOMOTIVE GAS TURBINES

... THE PASSENGER CAR PROBLEM

THE tubular heat-exchangers as shown in Fig. 6, Part I of this article (See AI Feb. 15, page 60) are too heavy and bulky for automotive use. Much weight and bulk can be saved by the use of extended surfaces. These can be in the form of fins, like the finned tubes used in steam heating, or cellular as in some automobile radiators, or in other shapes. The heat-transfer per unit weight of metal is greatly improved; but the fabrication, which generally requires brazing, is complicated, costly and unsuitable for quantity production. Figure 1 shows some types of extended surfaces. A further step is the laminar heat-

By

Dr. Pio Franco Martinuzzi

Professor of Mechanical Engineering
STEVENS INSTITUTE OF TECHNOLOGY

PART II

exchanger. This consists of metal plates, often ribbed, very near each other, about 0.1 in. or less; exhaust and air flow through alter-

nate pairs of plates in sandwich or layer-cake fashion. Standardized plates are used in packets of 50 or more, ingenious assembly devices being used to obtain standard compact packs. Due to the thin layers the flow is laminar and has greatly improved heat-transfer properties. This promising type, suitable for trucks or automobiles, is under test; there is as yet not much experience in the field. Exhaust and air collectors are complicated; exhaust deposits easily foul the narrow passages and cleaning devices to blow the soot away are generally provided. Figure 2 shows a laminar heat exchanger.

All heat-exchangers described above work by transferring heat across a metal wall which positively separates exhaust from air. There is, however, another type of heat-exchanger; it is sometimes called the regenerative heat-exchanger. As there is no agreement on nomenclature it will be called here "rotary heat-exchanger." It works on a different principle. An element capable of absorbing heat is alternately immersed in the hot exhaust and in the cold air, absorbing and giving out heat cyclically.

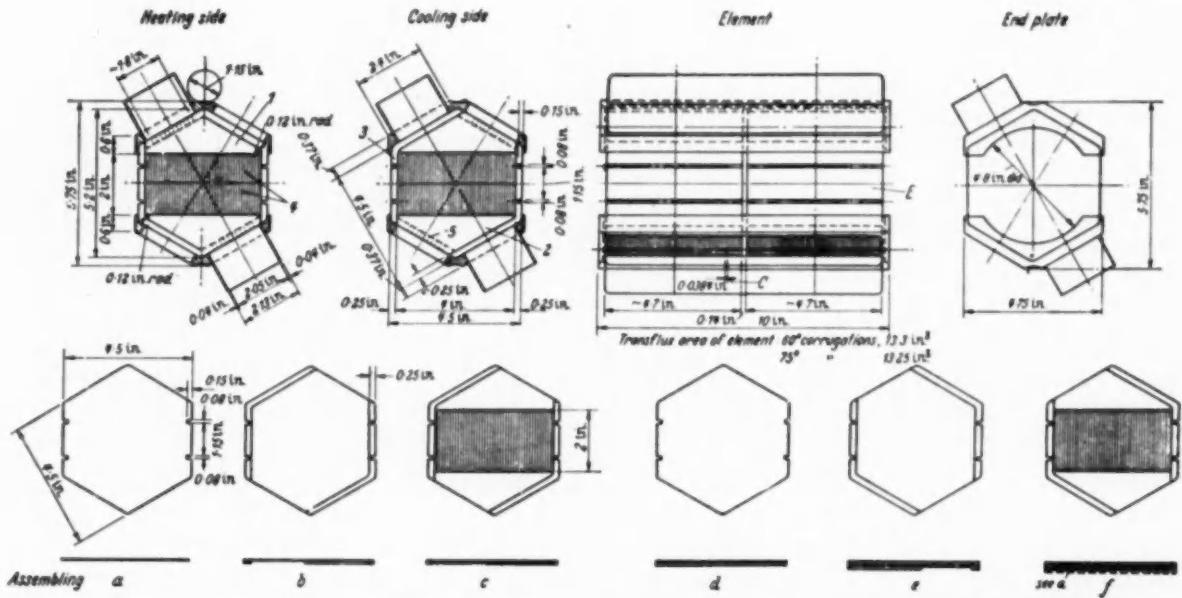


FIG. 1

Types of extended heat exchanger surfaces. (From *Heat Exchangers*, by W. Hryniak. Courtesy of Butterworths Scientific Publications, London.)

This principle has been used for centuries in brick factories to pre-heat the furnace air. Long tunnels full of bricks are used and through them air and flue gas are switched every day; as bricks absorb and give out heat very slowly the device is heavy. If, however, the element is a metal forming a spongy, porous mass, such as tightly packed steel wool or rolled metal wire-mesh, the heat absorption and release are very quick. In some special fine-mesh heat-exchangers used in the Philips external combustion engines, 3000 cycles a minute can be reached. In automotive rotary heat-exchangers from 20 to 100 cycles per minute are usual. The amount of heat transfer depends on the frequency and on the specific heat of the metal. Calculations show that, even at 20 cycles per minute, one pound of metal can transfer a very much larger quantity of heat in a rotary heat-exchanger than in even the best extended-surface fixed type.

A mechanism is needed to give the cyclic alternate contact of the elements with exhaust and air. Piston valves, to switch the gases over the elements, have been proposed, but the rotary type is in general use. In it, gas and air conducting leads are fixed in front of a rotary heat-exchanger part called the matrix, which rotates at constant speed so that each matrix element comes in front of the conduits. The change-over is gradual and continuous, one cycle per revolution; the gases move in counter-flow direction. A small electric motor rotates the matrix. There are two main types of rotary heat exchanger: the disk and the drum, shown diagrammatically in Figs. 3A and 3B. Rotary heat-exchangers have been used successfully for years to pre-heat air with flue-gas heat in large steam boilers. During the war in Germany Professor Ritz proposed this type for gas turbines. After the war he and his former assistant Dr. Hryniszak went to England and the early research and development work was done there. Many years were needed before successful automotive rotary heat-exchangers were developed in the United States.

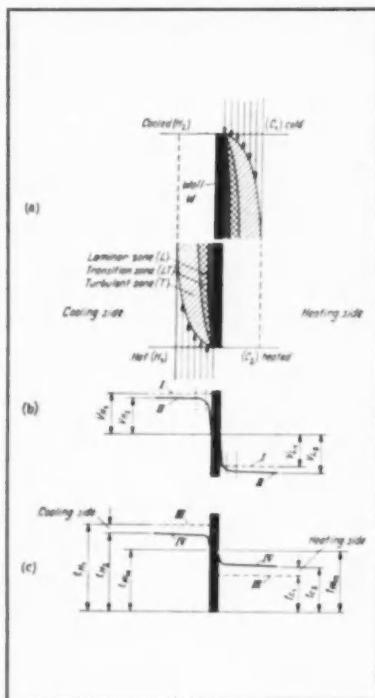


FIG. 2

Flow pattern, velocity and temperature profiles of a laminar heat exchanger (a) Flow pattern; (b) Velocity profiles; (c) Temperature profiles. [From Heat Exchangers, by W. Hryniszak. Courtesy of Butterworth's Scientific Publications, London.]

In a boiler, air pre-heating is easy; pressure differences between entering air and flue-gas are small, a few inches of water, so there are no problems in sealing the separation points to keep the air from leaking; if it does, the loss in flue draft is small. In a gas turbine, conditions are much more severe; with pressure ratios of about 4/1, the air is at about 45 psi higher pressure than the exhaust. Any leakage of compressor air into the exhaust constitutes a severe loss because much power is spent in compressing the air. Air is unavoidably leaked not only across the seals which rub-on the moving matrix but also through the "carry-over" loss; the compressor air being denser than the exhaust, it expands when matrix cells pass across the seal into the exhaust region.

In a gas turbine at full power, the best results obtainable with a rotary exchanger are total leakage losses of about four per cent, effectivenesses of 80 \div 85 per cent and pressure losses about the same as in a good tubular heat exchanger, 8 \div 10 per cent. Though the matrix is dense and requires a lot of pressure to be penetrated, its thickness is small, 1 in. to 2 in., hence the low pressure losses. However, in a gas turbine working mainly near full power, a four per cent leakage is prohibitive; it nullifies most of the advantages of the heat-exchanger while increasing weight, bulk and complication. While the matrix and the exchanger themselves are not big, carrying and taking away gas and air require piping which is generally awkward and bulky. For all these reasons the British, after many years of effort, gave up trying to use rotary heat-exchangers in their cars and heavy military vehicles.

Further work in the U. S., though not advancing the rotary heat-exchangers themselves, has shown that, under American automotive conditions, they can give excellent results in mileage per gallon in practical operation. The average large American car engine gives at least 250 hp; this power is never required in level running and very seldom on hills or when accelerating. A passenger car, even a heavy one, requires at most 40 hp at town driving speeds and perhaps 60 \div 80 hp at 60 mph. Consequently, most steady driving is done at very low part load, 15 \div 35 per cent; higher loads are only required for very short times during acceleration or on hills. Part load is obtained by injecting less fuel in the combustion chamber and thus decreasing the turbine inlet temperature. In a split-shaft machine, a decrease in temperature has the effect of decreasing the compressor turbine speed proportionally to the square root of the absolute temperature, the compressor flow proportionally to the rpm, and the pressure ratio proportionally to the square of the rpm. Consequently, the power absorbed by the compressor decreases with the cube of the rpm. Figure 4 shows

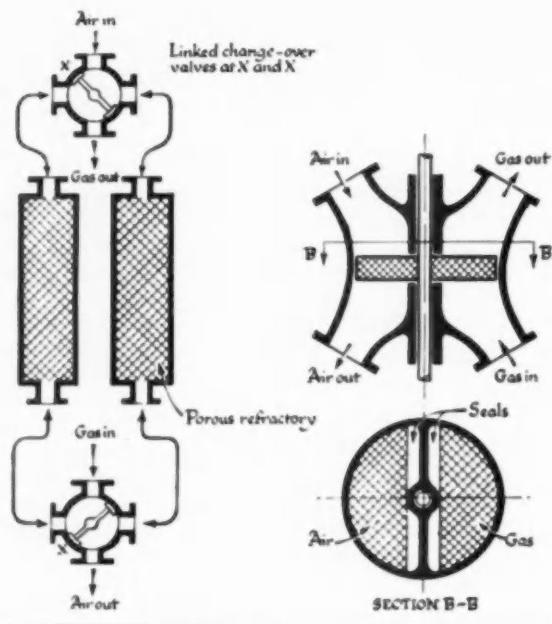


FIG. 3A

Regenerative heat exchangers. Principles of stationary and rotating disk types. *The Gas Turbine Manual*, (Temple Press Ltd.)

the operating conditions of the turbine of Figure 5, Part I when the fuel input is reduced to about one half. The data are approximate. The pressure ratio falls to 2.83/1; leakage and carry-over decrease proportionally to the pressure difference across the seals and the low-pressure air lost is less expensive; as the flow decreases and the heat-exchanger is still the same, effectiveness increases and pressure losses decrease. The final result is that the cycle efficiency remains nearly constant even at this low load; in both piston engines and non-recuperative gas turbines it would fall very rapidly. In actual operation the mileage per gallon of the best American gas turbine cars is about the same of that of the corresponding cars with conventional engines and automatic transmissions. The fuel is cheaper and lubricating oil consumption becomes nearly zero. These results are good but there is still room for improvement. ■

Part III of this three-part article will appear in an early issue of AUTOMOTIVE INDUSTRIES

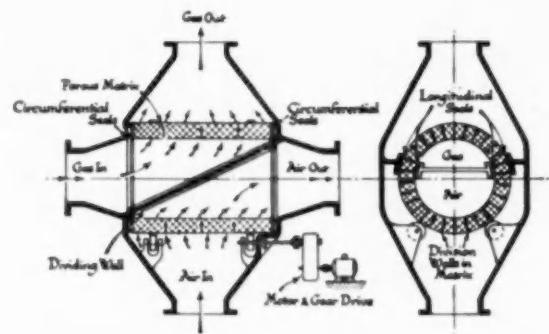


FIG. 3B

Drum type Rits regenerative heat exchanger. For greater clarity the driving drum mechanism and rollers are shown in left hand drawing below their correct position. They are in the correct plane in the right hand sketch. *(The Gas Turbine Manual* (Temple Press Ltd.)

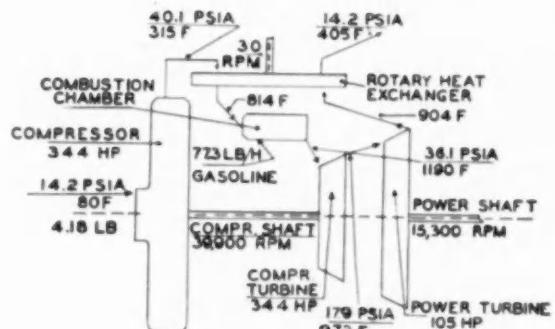


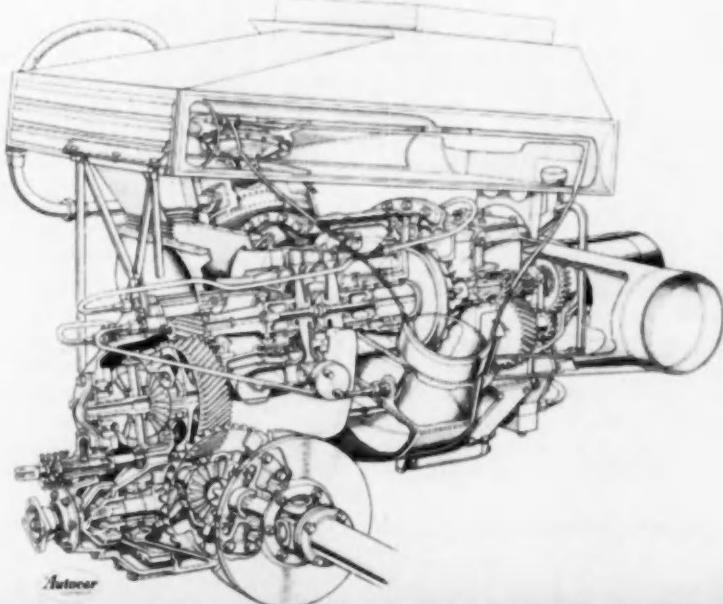
FIG. 4

Part-load operation of automotive gas turbine shown in Fig. 5, Part I

of this article. *(Automotive Industries, February 15, 1961, page 60)*

FIG. 5

Rover 25/100 gas turbines as installed in a car. It develops 110 hp. and is of the two-shaft type, with recuperative heat exchanger. There is an air intake on each side of the engine; these are used for mounting the unit to the chassis.



..... Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

FUNDS available for highway construction in 1961 will be higher than those for 1960, estimates from the Bureau of Public Roads show. Nationwide receipts for highways in 1960 will be more than \$11.5 billions when all figures have been totaled, and it is expected that 1961's total will rise to nearly \$12 billion. Capital outlay for highway right-of-way and construction is expected to reach an all-time high of about \$7 billion in 1961, considerably above the 1960 figure of \$6.3 billion and surpassing the earlier top total of \$6.8 billion in 1959.

Highway construction expenditures, the figure of most interest to contractors and construction equipment builders, should rise to nearly \$6 billions in 1961. This figure excludes right-of-way costs, but includes engineering costs. It compares with \$5.5 billion in 1960, and \$5.9 billion in 1959. Right-of-way costs account for nearly 15 per cent of total capital expenditures for all roads and streets, and for nearly 25 per cent of the total on the Interstate System.

The Interstate System will take about a third of the construction expenditures in 1961, and all Federal-aid systems together will account for nearly three-fourths of the total.

Excavator Has Two Engines

An excavator with some unusual features has been announced by Manitowoc Engineering Corp., Manitowoc, Wisc. An outstanding innovation is the use of two Diesel engines, one powering the digging operations, the other the travel and swing of the machine. This gives the operator independent control of these two operations, and gives the new machine its model designation. It is called the Manitowoc 4500 "Vicon," derived from "variable independent control."

A long-standing difficulty in ex-

cavator operation has been that, in digging, the operator has opened the engine throttle to get maximum power for the heavy bite, and has had to throw in the clutch for swing as the engine was racing. This usually caused clutch slippage. An alternative was to delay throwing in the clutch for swing or travel until the engine had slowed down somewhat; this slowed the work. Manitowoc's claim is that, with separate engines powering the digging operations and the travel and swing, each can be controlled independently of the other. Travel and swing ordinarily take only 20 per cent of the total power output, so that a smaller engine can be used for this purpose.

Controls have been simplified by another new feature. Clutch control levers incorporate the throttle for the engine, the first 10 deg of travel of the clutch lever from a neutral position engaging the clutch, and additional travel accelerating the engine. As with conventional controls, the direction in which the lever is moved from the neutral position, forward or backward, determines the direction of swing travel or of drum rotation. Engines are coupled to the load through torque converters to provide smooth drive. Because the clutch is let in at the beginning of the movement of the lever, and engine acceleration begins after the first 10 deg of movement, the clutches are always engaged at low engine rpm and torque.

Motor Grader Announced

A new motor grader, its 330-H model, has been announced by LeTourneau-Westinghouse Co., in addition to its 330 model. The new machine, at 100 hp, has more power than the earlier model.

With a choice of GM 3-71 or Cummins V-6-BI engines and a heavy-duty constant mesh eight forward speed transmission, the new motor grader has speeds up to 23.6 mph. Creeper gears are avail-

able as low as 1/4 mph. There are four reverse speeds of from 1.7 to 12.2 mph. Front axle clearance is 25 in. Power steering, oversize front tires, and a wide range of accessories are available as optional equipment.

Appropriations for Highways

Action by Congress will be necessary if the full apportionment of \$2.2 billion is to be made to the states for work on the Interstate Highway System, outgoing Federal Highway Administrator Tallamy indicated. Without such action, only \$1.8 billion could be apportioned. This is for the 1963 fiscal year, beginning July 1, 1962, and the law now requires that revised estimates of the cost of completing the system must be approved by Congress before apportionments are made for fiscal years 1963, 1964, 1965, and 1966.

Federal Highway Administrator Tallamy, who steps down to make way for Rex Whitton, the incoming administration's nominee, has indicated that an additional \$10 billion will need to be authorized to complete the Interstate System by 1972.

Effects of Earthmoving Machinery

Measured by an index of average bid prices compiled by the Bureau of Public Roads, cost of highway

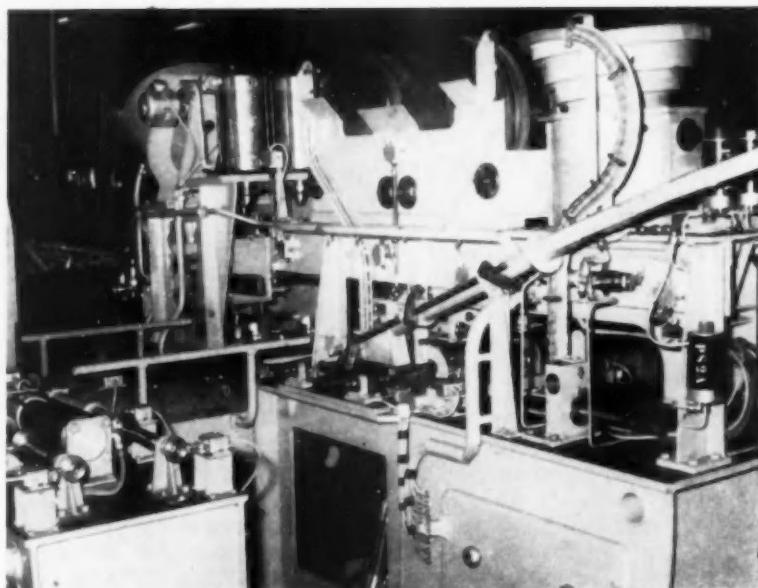
(Turn to page 61, please)

Assembling Renault Steering Gears on Automatic Transfer Lines

By David Scott
BRITISH CORRESPONDENT



Dauphine steering gears comprise 48 components. Coil spring assists self-centering action, since the front wheels of the rear-engined car are lightly loaded. Rubber bushing inside the spring stops rattles.



THE main Renault factory at Billancourt, near Paris, is now assembling rack-and-pinion steering gears for the Dauphine car on an automatic transfer line with a capacity of 150 units per hour using a total of 11 men. The line comprises a loading station, 11 fully-automatic stations, and four semi-automatic ones.

Stations are pitched at 3.9 ft and each is a double setup handling two work pieces simultaneously on a 48-second cycle, so every operation shown in the accompanying illustration is duplicated. The one-piece walking-beam transfer bar, 65 ft long and weighing 1540 lb, is pneumatically operated, as are practically all functions at the individual stations.

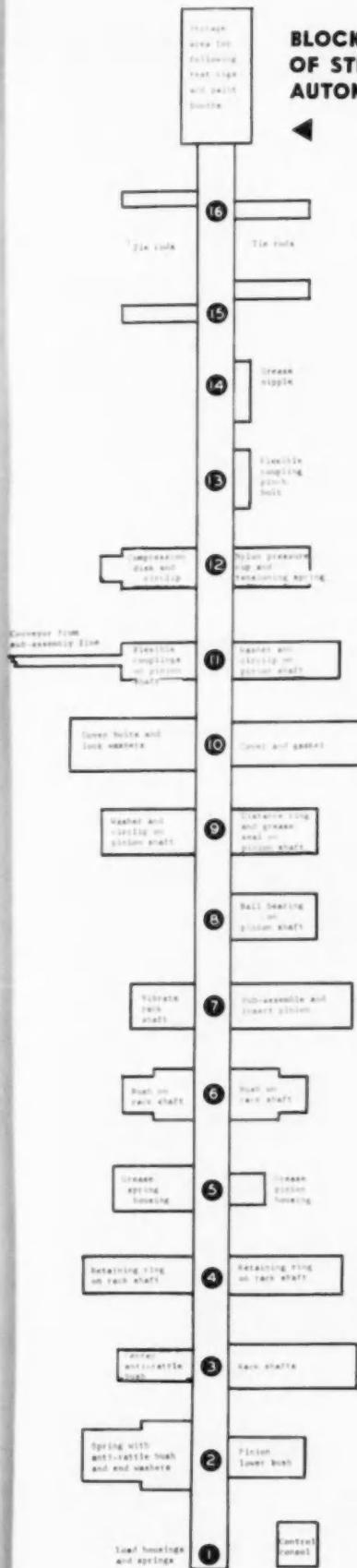
The line was completely designed and built by Renault, which has been described as the most highly automated car plant in the world. This company has long experience in building automatic equipment for machining, and extensive capacity for producing it.

(Continued on page 41)

STATION 2

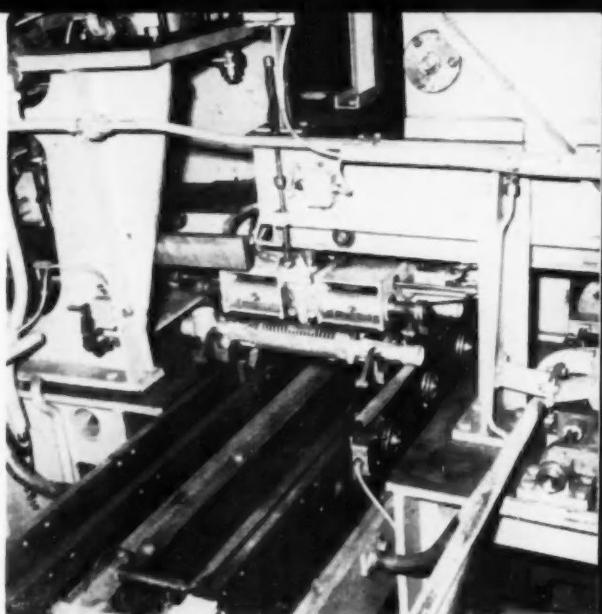
Rear view of Station 2. Each coil spring reaching 2L (foreground) by inclined chute is sub-assembled with an internal rubber bushing and end washers in a shuttling cradle at the base of the chute. When a spring is released into the cradle, a rubber bushing fed from the vibrating hopper overhead is dropped in behind and pushed half-way through the coils by a ram. The cradle then shuttles transversely to its first position where the two end washers (supplied from the pair of central drum hoppers) are dropped in place. Now the cradle shuttles further, and a traveling gripper descends, compresses the spring by its end washers, and retracts with it.

BLOCK DIAGRAM OF STEERING GEAR AUTOMATIC ASSEMBLY LINE



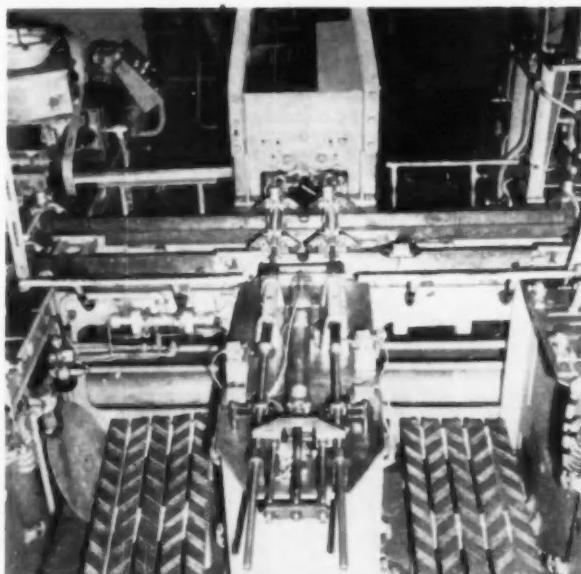
STATION 2L

Gripper carriage on an overhead rail transports the compressed spring from the pre-assembly position at Station 2L to the housing clamped on the central track. When directly over the housing it descends, releases the spring in the cavity, and retracts upwards and rearwards (to the right) for the next cycle.



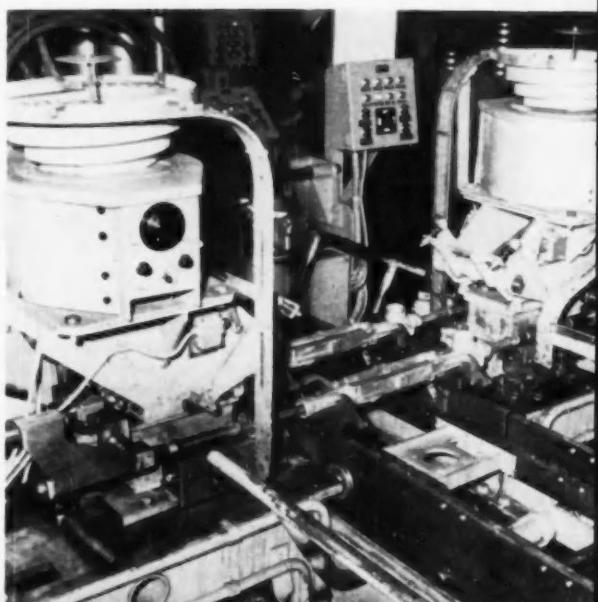
STATION 3

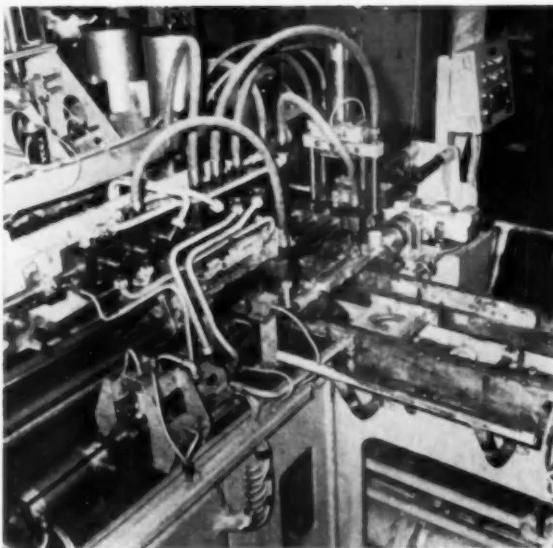
Left-end view of Station 3, where rack shafts are fed in from the box-like storage magazine on the far side. At the start of the cycle, the twin pusher rods at 3L (foreground) enter the housings and springs, align and slide the internal rubber bushings across to the other ends. A pair of shafts then drop from the magazine onto grooved guides, and are pushed through the springs and then through the bushings, which are retained by the end washers at the near side.



STATION 4

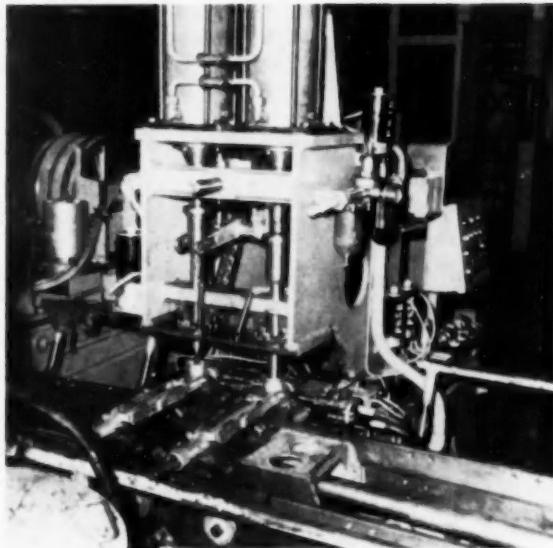
Identical equipment on both sides of Station 4 seats spring retaining rings in circular grooves on the rack shafts behind the end washers. Considering only one operation, rings from the vibrating hopper drop by chute to a small transfer arm that aligns each one with the shaft end. A split tube on the nose of the pusher rod forces the ring over the shaft chamber and along the shaft until it is seated. Opposed pushers operate simultaneously to stabilize the shaft axially.





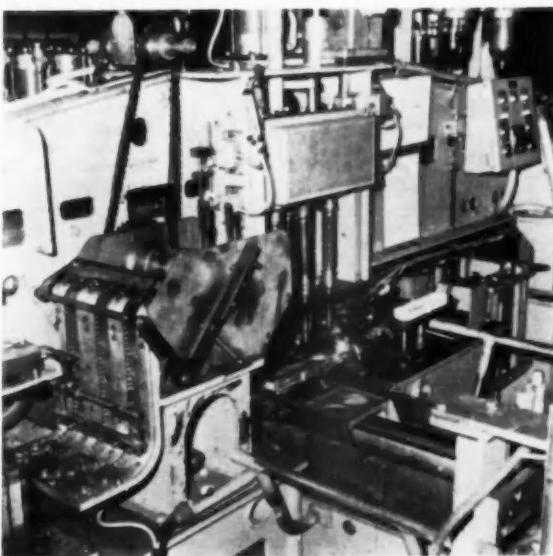
STATION 5

Grease is pumped into the spring and pinion housings at Station 5. Traveling nozzles on SL (left) spread the heavy lubricant over the coils on the forward stroke of their ram, and on their return stroke their feed cylinder is automatically charged with a metered quantity of grease. Meanwhile, vertical nozzles at SR dip into the pinion housings to inject a measured dose of lubricant. Finally, the shaft is rotated to orient the rack teeth to accept the pinion when it is inserted at the next station. This is done by an electrically-driven collet clutch at SR that travels inward to grip the shaft, then turns it until stopped by a microswitch sensing a flat groove opposite the teeth.



STATION 8

One-sided Station 8 loads and presses ball bearings over the pinion spindle. Bearings supplied from a six-hole drum magazine are fed by gravity chutes to the twin pre-load positions, where they are retained on the underside of the ram holes by spring-loaded pawls. As each vertical ram operates, the spring-loaded nose of its two-stage plunger engages the bore of the inner race with a rubber ring and pushes it through the pawls, after which an outer collar presses the bearings into the housing. The bearing is then greased by a nozzle entering the tensioning spring hole on the side of the housing opposite the rack teeth. These two nozzles are carried on a cross-traversing slide.



STATION 10

After the cover plate (seen here in transit) is dropped on the housing, the loading frame with bolts and washers in position travels in from 10L (left) to overhang the tapped holes. The multiple nut-runner in the center of the bridge then moves down, and the tapered noses of the box wrenches wedge apart the spring-loaded slides to release the bolts and washers. The wrenches engage the bolt heads and pass through the frame holes during tightening. When the wrench spindles retract they are radially positioned automatically for the next cycle.



STATIONS 13, 14, 15 and 16

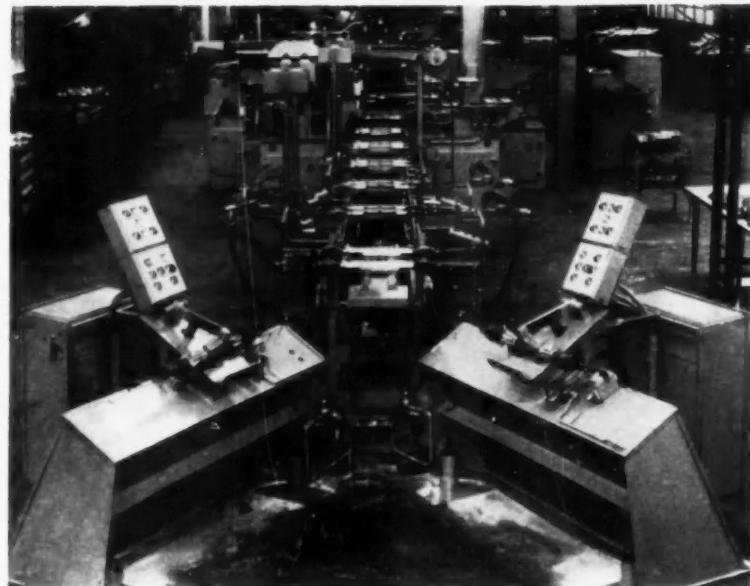
Steering gears are completed at four semi-automatic stations at the end of the line, where work is still advanced by the full-length transfer bar and secured at each position by toggle clamps. One man inserts and tightens the flexible coupling pinch bolt at Station 13 and the grease nipple at Station 14. At Stations 15 and 16 (foreground), pre-assembled tie rods and covering gaiters are added. Power tools on location arms, with operating switches interlocked with the transfer bar control circuit, are used on all these operations.

Two years ago its first auto-assembly line—for adding main bearing caps to the engine block prior to finish boring—was installed. But the steering gear line is a much more ambitious project, complicated by the large number of different parts and operations involved. It called for new ways of thinking about component design, manufacture and handling.

Close tolerances must be kept on even the simplest parts, such as the previously-mentioned ring. The tensioning spring (Station 12) gave trouble at first, because heat generated when the coil ends were ground flat during manufacture caused the wire to expand slightly, so that the spring would not drop freely into the nylon pressure cup.

For example, ends of the rack shaft require a two-step chamfer for no functional purpose other than sliding the ring springs, on at Station 4. Similarly, the pinion gear is broadly chamfered to pass the snap ring (Station 7) and ball bearing (Station 8).

For automatic assembly, too, components have to be free of burrs, carefully degreased and cleaned to prevent two pieces sticking together, and closely inspected to



End of the 78-ft transfer line, where completed steering gears are inspected and tested for correct functioning on a pair of motor-driven rigs. As a final operation, exposed ferrous parts are painted in two manual spray booths behind the camera. Units are then transported to the Flins assembly plant where Dauphine cars are produced.

eliminate misfits that a manual operator would reject but a machine cannot.

Most difficult operations were initially thought to be sub-assembling the pinion with a snap ring and rubber bushing at Station 7, and aligning the cover bolts at Station 10. But the biggest headache turned out to be Station 9, where

a snap ring is placed over a thin washer and the two are then pushed over the pinion shaft to seat in the housing.

Such problems and teething troubles considerably raised the design and development costs of the line, but Renault regards the project primarily as an exercise in engineering research and technology. ■

Exhaust Study Urged in Fight on Smog Control

Control of unburned automobile exhaust fumes won't be enough to cut down the smog problem. Designers will have to plug other leaks which permit hydrocarbons to escape into the atmosphere.

This view was given by Southwest Research Institute engineer Kenneth D. Mills in a report prepared for the Motor Vehicle Pollution Control Board of California.

Unburned hydrocarbons which are chemically changed by the sun's rays have long been known to be one of the major causes of the eye watering, plant damaging smog which has plagued many major cities.

Studies have been made of possible chemical devices, catalytic afterburners — or direct flame afterburners which would oxidize the exhaust gases.

However, Mr. Mills says, even the most efficient exhaust control device would only make the auto a little more than half safe. The automobile industry has recognized the importance of crankcase "leaks" and has already voluntarily taken design steps to reduce this smog source.

Noting that the crankcase emits both the unburned gas which escapes between the piston and the rings (blowby) and the oil vapors,

it has been suggested that these fumes be recirculated through the combustion system and again attempt to burn them.

Mr. Mills says this system will reduce the percentage of hydrocarbons which are vented into the atmosphere, but he points out that it may also result in gummy deposits on valves and pistons.

Instead he suggests that the crankcase fumes be channeled to the afterburners and oxidized there with the exhaust gases.

Mr. Mills urged further research on such a system and also studies of gas which escapes from the carburetor into the atmosphere.

Moving Bolster Press Line Handles Wide Variety of Parts

A NEW concept in press utilization has been in operation for about a year at the Fisher Body plant in Grand Rapids. This is the moving bolster press line, the first installation of its kind in the USA. Intended exclusively for short run parts in any variety within the capacity of the equipment, the line consists of an 800-ton Clearing toggle press with an inner and outer slide for making heavy draws; followed by an 800-ton Bliss press, and a line-up of six 400-ton Clearings.

Placed in operation early in 1960, the line was retooled later for producing outer rocker panel stampings for 1961 cars. To handle the current program, there are eight sets of dies, covering some 14 different part numbers. To effect this variability some of the dies feature interchangeable and removable sections that permit a given die to produce more than one kind of part.

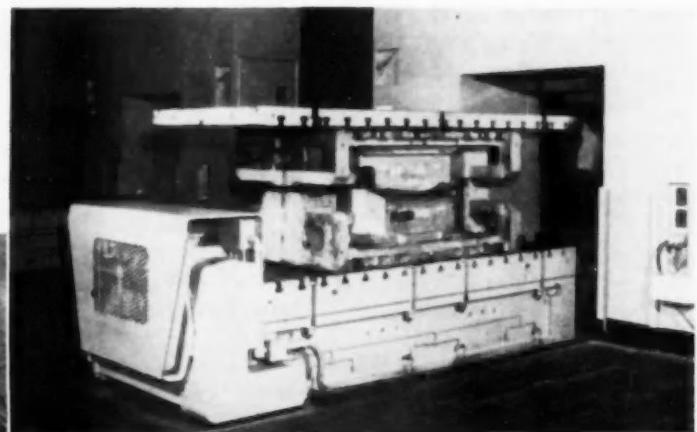
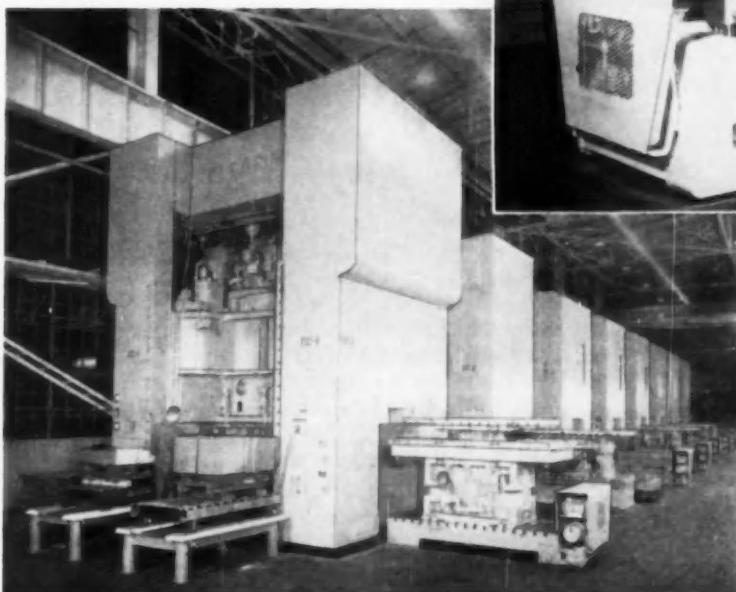
By Joseph Geschelin

DETROIT EDITOR

A noteworthy feature of the moving bolster principle is the provision of rails on which the dies are transported into and out of the press bed on self-propelled carriages. Each die is equipped with its own adapter plate for both inner and outer slides. In operation, when the schedule calls for a changeover of the line, the dies for the next part are transported from the storage area and mounted on the bolster of the presses on one side of the line. When the line is

ready for changeover, the presses are stopped, and each press die is automatically unclamped and moved out of the press bed under its own power in a fully automatic cycle. Pressing another control button starts the cycle that moves the next die into the press automatically, from the opposite side, again automatically clamping both slides securely.

According to Fisher Body management the important advantage of the moving bolster design lies in the quick changeover from one part to another. As a matter of fact, the die change for the entire line-up can be made in less than half hour. Of course other changes



▲ Close-up of one of the self-propelled carriages ready to move the new die into a press.

◀ Perspective view of moving bolster press line. The first press is an 800-ton Clearing, followed by a Bliss press of the same tonnage. The remaining presses are Clearings.

have to be made before the press line can restart, thus increasing the total time interval for the changeover. Incidentally, the management believes that the most efficient operation of this kind of line would result from really short runs and a sufficient variety of parts to keep the line in constant operation.

The moving bolster line at Grand Rapids is currently running two shifts per day and is producing some 36,000 stampings per week.

Apart from the rapid changeover, another important advantage of the moving bolster design is that die spotting (in the case of a new die) can be done right in the press during the third shift which is assigned for maintenance for the entire plant. The facility with which a die can be moved into and out of the press bed makes die spotting much easier and faster than with conventional practice.

In the production of the variety of rocker panels, which come in different sizes, it is of interest that some parts require only four presses, some six presses. This releases the last two 400-ton presses for other parts.

One of the problems incident to the requirement of a large number of dies for servicing the press line is that the stand-by dies must be assigned extra storage space, thus adding to the budget burden on the line. On the other hand, this does not affect changeover time since the dies are delivered from storage to the presses before the changeover is affected.

Besides being new in overall concept, the moving bolster press line also embodies some noteworthy features considered new in press design and operation. In the first place all of the presses in this line are of bottom drive type. The bed of the press is provided with keys for locating the carriage in working position. Then an air-operated bayonet lock engages the bolster carriage to index lock it in position. Hydraulic die clamps provide the automatic clamping of the upper die through T-pockets in the adapter plate.

Another important feature is the automatic shut height approach,

designed to accept a new die without loss of time. Shut height is set on a calibrated dial, corresponding to the measured height of bolster assembly. When actuated, the slide lowers with rapid approach and automatically stops $\frac{1}{4}$ -in. above the shut height. The operator then inches the slide to its final adjustment.

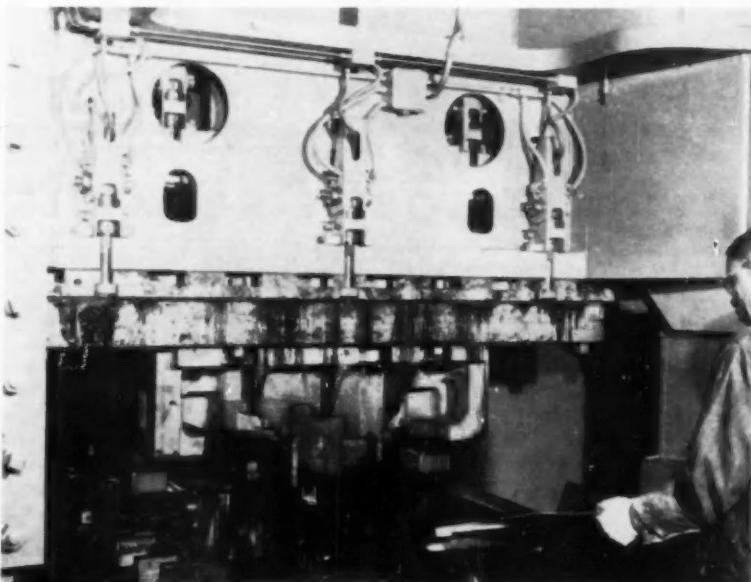
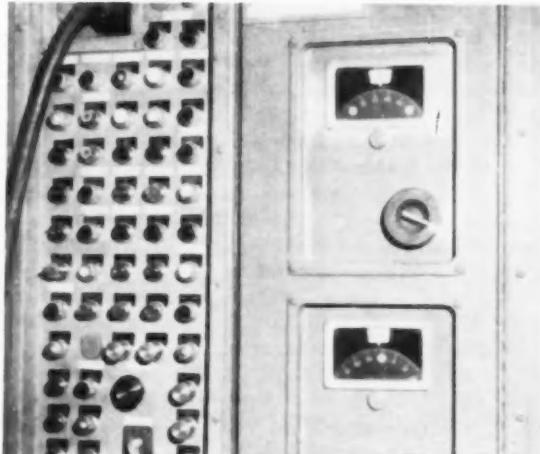
The hydraulic overload device incorporated in these presses is another feature of major importance to the management. It is a mechanism applied to the four points of suspension of the slide

with hydraulic cylinders set to a pre-selected tonnage. If overload occurs, due to any cause, a relief valve opens, allowing oil to return to the reservoir and tripping a pressure switch to unload the slide. This prevents damage to the press or the dies, since the press cannot be re-started after an overload until the circuit has been reset.

It is obvious that this overload feature constitutes valuable insurance against damage. What is equally important is, after cause of the trouble has been corrected

(Turn to page 61, please)

Control panel on one of the Clearing presses. The dials at the right control the height adjustment for the upper and lower slides to suit each die set.



View taken between a pair of presses, showing manual loading of the succeeding press. This is typical of the entire setup. Unloading of the work from the preceding press is done automatically by means of the "iron hand."

RELIABILITY PROGRAM • • • at Oldsmobile • • •

As time goes on more and more vehicle manufacturers are taking a stand on reliability. In the new concept of overall reliability quality control becomes just one of the major facets of the control program—a vital but by no means the most important element.

Although many divisions in General Motors Corp. are embarking on reliability programs, they are not required to follow any set pattern—only the objective is the same. Each organization is charting its own course, in its own way. Eventually, the combined experience of many organizations may serve to guide everyone on a course that will produce optimum results with the least expenditure of energy and money.

Meanwhile, we have had an opportunity of studying a reliability program at Oldsmobile. It is noteworthy that Oldsmobile has taken an entirely novel approach to this problem. Acting on the premise that little

By Joseph Geschelin

DETROIT EDITOR

can be gained simply by setting up an organization and tightening up on quality, the division is basing its entire program on what it terms a "feed-back" system. The gist of it is that before any corrective action can be taken, it is necessary to know exactly what is happening in the field: what the service experience is with the new cars; what parts give trouble; which problems are most important from the standpoint of safety and owner satisfaction.

These are only a few of the many questions involved. Reports now reaching the factory are primarily for the purpose of recovering warranty costs for the dealer.

The factory, in turn, spreads a portion of these costs to the supplier. Such charges have proved a powerful stimulus for product improvement over the years, but more emphatic selection of problems is necessary. What about the service problems—minor or serious—that occur after the warranty period, and after policy extensions? Even serious shortcomings may be overlooked unless some means of definite and unfailing reporting are established.

Another thing that Oldsmobile Management has taken into account is that durability records must be accumulated for older models. The car must perform faithfully for thousands of miles beyond warranty and policy adjustment periods. Do the components stand up after the first year of service? Are some components too long lived? If a car is discarded after a certain period of service—junked—what economic value is there in parts—that could still give

Here is the Reliability Survey form that will be attached to the service order form. When these forms are filled out completely they will provide invaluable information hitherto unavailable to the factory.

OLDSMOBILE RELIABILITY SURVEY

ITEM	WAS CAR INOPERATIVE?	CIRCLE ONE YES NO	BRIEF DESCRIPTION OF PROBLEM, CAUSE AND CORRECTION IF KNOWN, REMARKS OR RECOMMENDATIONS.	FACTORY USE - LEAVE BLANK
	HAS THIS PROBLEM OCCURRED ON THIS CAR BEFORE?	YES NO		
	IS CAR REPAIRED TO YOUR SATISFACTION?	YES NO		
	TO OWNER'S SATISFACTION?	YES NO		
	IS CAR SERVICED REGULARLY BY YOUR DEALERSHIP?	YES NO		
IF RADIO, CLOCK, ETC., SENT OUT FOR REPAIR, WAS SERVICE SATISFACTORIAL	YES NO	IDENTIFYING MARKS ON PART OR ASSEMBLY THAT FAILED.		
ITEM	WAS CAR INOPERATIVE?	CIRCLE ONE YES NO	BRIEF DESCRIPTION OF PROBLEM, CAUSE AND CORRECTION IF KNOWN, REMARKS OR RECOMMENDATIONS.	FACTORY USE - LEAVE BLANK
	HAS THIS PROBLEM OCCURRED ON THIS CAR BEFORE?	YES NO		

This is a typical service order form that will be supplied by Oldsmobile to dealers reporting on the reliability program.

additional service. In short, there is a fair prospect that the right kind of statistical evidence would make it possible to reapportion the life of components in such fashion as to make their endurance limit approximately the same. This could lead to a major saving in cost and material without downgrading reliability.

In any event, such reasoning eventually leads to the conclusion that the way to initiate a reliability program is to start with some sure scheme for accumulating field service data of the right kind, having the proper weight from a statistical point of view; and above all to get such reports without delay.

That is the basis for Oldsmobile's feed-back approach. The division has found that the accepted

sources of information simply are inadequate. The conclusion is that the only basis for a reliability program is a system of reporting by selected Oldsmobile dealers by feed-back of data taken from actual owner problems.

Information for the system will originate from a number of Oldsmobile dealers selected geographically in such manner as to represent various driving conditions. Moreover, such dealers must be representative of nation-wide experience in terms of servicing present and past model cars in a normal relation to sales volume. The point is that the dealers must provide a representative sample, satisfying the requirements of statistical analysis.

In the establishment of the program dealerships selected for Re-

porting Centers must meet the following tests:

1 Reports must be in proportion to the sales volume of a given Zone

2 Special driving condition areas must be represented, i.e., mountainous regions, desert country, extreme north for sub-zero weather, etc.

3 Servicing of present and past model cars must be in relation to sales volume

Even on a sampling basis of the national distribution picture the amount of reporting and paper work is enormous. For the purpose of a trial run the division already has feed-back reporting from a selected number of dealers in the Detroit and Milwaukee zones. This will provide an opportunity for checking on the adequacy of information requested on the several forms, to be described later, as well as a check on how the procedure

is being followed. Since the dealers involved in the trial run are fully qualified they will remain in the final feed-back system when it has been placed on a nation-wide basis.

As we mentioned earlier, no changes will be made in current procedures until the feed-back begins to work. Meanwhile, Oldsmobile has set up a Reliability group headed by a director who reports directly to the chief engineer. This is another special feature of the program. The reliability group here is concerned with product design and evaluation primarily. Naturally, when the returns are in and have been properly evaluated, the information affecting other responsibilities in the company will be passed on through an established procedure. It is important to emphasize, however, that the Oldsmobile reliability group operates within the product engineering department rather than in the manufacturing departments.

The feed-back procedure, taken directly from actual owner conditions, is expected to accomplish the following results:

1 Provide product reliability information rapidly and in sufficient numbers to allow accurate determination of design, manufacturing, quality control or service deficiencies

2 Indicate and evaluate problems not apparent from existing information

3 Determine the relative seriousness of problems

4 Provide past model information for design analysis and for determining reliability beyond warranty

5 Improve evaluation of all assembly plant operations

6 Provide information that will assist in evaluating suppliers

7 Indicate methods of improving the preventive maintenance program

8 Permit correlation of accelerated testing with field performance

The reports from feed-back dealerships consist of Special Repair Orders which include a Reliability Survey Form. Service Order copies with Survey Forms attached are to be mailed daily. Incidentally, copies of all repair orders are to be mailed in even if they do not contain Survey items, or cover other makes of cars, or are cancelled.

Oldsmobile will design the forms, in cooperation with the dealers, will pay for printing the forms, and will provide addressed envelopes that require no postage. The forms are all numbered, hence the

injunction that all forms are to be forwarded without fail.

As dealer reports are received in Lansing, the information will be translated into a special code classification and promptly transferred to IBM cards. Selected bits of data from the repair order, together with comments on the survey form will provide the basis for the evaluation of each item with regard to safety, owner reaction, and expense, and will permit the assignment of an overall "seriousness" value. IBM processing will be employed to sift significant problem trends as well as pertinent factors such as: assembly plants involved; body styles; engine or transmission numbers; troubles incident to specific geographical regions; etc.

Summaries of problems in order of importance are sent directly to the General Manager (J. F. Wolfram). Copies are routed to engineering, production, inspection, and service departments together with detailed information leading to a determination of prompt corrective measures.

In the Reliability organization there is a special design analysis group whose function it is to study all report data on current as well as past models when evaluating future designs. This should be instrumental in bringing to light any features which have given trouble in the past.

The basic reporting procedure is built around a standard form, imprinted for each dealer participating in the program. As illustrated, it consists of a standard three-sheet Repair Order, bound together with an extra copy containing the fold-out Survey Form. The latter is printed on both sides with spaces for six different repair services per order. The Survey Form also contains the special instructions for filling it out correctly and completely.

The feed-back system also contemplates the issuance of special bulletins to Reliability Survey Dealers when the occasion arises, covering such items as:

1. Changes in reporting procedure.

2. Requests for special information.

3. Identification marks on specific parts.

4. Requests for the return of certain parts for examination.

It is estimated that the net volume of reports reaching Lansing will be about 25,000 per month or about 1200 reports that will be handled daily. This volume of reports will represent about five per cent of total sales of Oldsmobiles.

After the system is in full operation, the Reliability group intends to develop some special reports for the General Manager and other staff members. These include the top 20 major problems at a given time; accessory and partial usage items; complete details; and information on past model service problems.

Since this system of feed-back reporting is a new concept and involves considerable detail, steps have been taken to organize schools for training in the procedure. The school is brought to the individual dealer's establishment, providing instruction to all personnel designated by the dealer. Schools are being conducted by regional service managers, accompanied by the zone service manager and service representatives.

Lastly there is the problem of policing the reporting system to make sure it works. Zone service managers and service representatives are responsible for following up on the reporting by dealers. In addition, the reliability group will maintain a file on inadequate reports. If consistently poor reporting is indicated on the part of any dealer, such information will be routed through the service department to the zone service manager for corrective action.

One final point of general interest. It is obvious that eventually all of the Oldsmobile suppliers will be brought into the picture. Certainly the correct operation of the vehicle hinges on the performance of every element and the weakest link can start a lot of trouble. Suppliers are being alerted to the fact that the feed-back system is now in progress. Each supplier will be expected to institute a reliability program to forestall trouble. Naturally, as weaknesses are brought out by the feed-back system, suppliers contributing to the problems will be called in for explanation and corrective action. ■

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By C. J. Kelly

ASSISTANT EDITOR

ROBOT MACHINE FEATURES BRAIN WHICH CAN REMEMBER UP TO 200 SEQUENTIAL COMMANDS

A "HUMAN" machine has been developed for American industry by the Consolidated Controls Corp., a subsidiary of Consolidated Diesel Electric Corp. Named Unimate, this device will perform any operation continuously after being led through the motions once. The machine has an arm that will duplicate some of the functions of the human arm and a "brain" capable of remembering up to 200 sequential commands. The brain, called Dynastat, will operate the unit continuously until a new routine is taught to it.

This Dynastat memory gives the Unimate robot its ability to remember complex work procedures after being led through the work cycle one time. The memory drum has a capacity of 16,000 bits of information. These are recorded in 200 rows around the circumference, each row consisting of 80 bits parallel to the drum axis. The 80 bits per row represent the number necessary to control all of the functions which may be needed for Unimate to make a movement and to actuate auxiliary machinery.

In the teaching process for a new operation the operator employs a series of detachable teaching controls. These controls are placed on the different sections of the arm that are to be controlled and a main control is placed on the console to relay the message to the brain where it will be registered on the memory for repeated operation. The controls have but-

tons which, when pressed, lead the Unimate's arm through the lesson. A switch is provided to allow the operator to open and close the hand on the workpiece at the desired spot, and to release it where the next operation is waiting.

To register a movement on the Unimate's memory the operator pushes a button on the hand-held record control. The record button actuates amplifiers which drive "write" heads which, in turn impress a magnetic pattern on the drum. The drum then steps to the

next movement to be taught. This step-and-record sequence may be continued until the operation is complete. Any number of operations from 1 to 200 may be recorded in this fashion.

After the first operation the machine is then allowed to go through the movements by itself at a very slow speed where the operator can check each move to assure correctness. If desired, each movement can be accomplished on a single move basis.

In the event of a mistake by the operator after having already taught the machine a number of moves it is not necessary to start over. The wrong move is easily erased and repeated correctly.

A unique feature of the Unimate is the consolidation of the controls and mechanical operating section into one unit. The machine does not require bolting to the floor and can be moved at will to any spot where its services are required. The base of the unit is constructed to allow a fork truck to move it. The floor area where Unimate is to be placed need not be level as the control pattern will compensate for any uneven situation. ■



Shown at right (top to bottom), in a simulated factory activity, the Unimate picks billets from a feed chute, places them in position for a two-stage forging operation, and delivers the finished part to a conveyor.

METALS

National Output of Steel Holding Steady at 50 Per Cent of Capacity. Stocks Are Reduced to Less than 10 Million Tons.

By William F. Boericke

Little Improvement In Steel Demand

New orders for steel levelled off in mid-February. While some improvement appeared in demand for line pipe, tin plate, and galvanized sheets, the total did not compensate for the reduced orders from the automobile makers, steel's biggest customers.

However, the national output holds quite steady at 50 per cent of capacity, or an indicated 75 million tons annual rate. The great bulk of steel buying is now being done on a "ship tomorrow" basis, indicating that consumers inventories are at or near bottom, hence it is quite possible that a sudden flood of orders could pick up the March operating rate substantially.

Tin Plate A Strong Spot

Not all lines are depressed. Tin plate is the brightest spot. Orders began to rise right after the start of the year and have been improving consistently. Galvanized sheets are in good demand. So is line pipe used in ore and gas transmission. It would appear that oil and gas drillers have been living off their inventories until now. In spite of the bad weather that has extended across the country, heavy structurals are getting a call, and this demand is expected to improve as spring approaches. Steel makers report a growing volume of small tonnage orders to plug holes in inventories. Some heavy orders have been received for missile steel, marked rush delivery. This suggests that defense contractors have been operating with little or no inventory. Any surge in defense spending would bring in urgent demand for more steel.

Purchasing Agents Are Hopeful

While it cannot be denied that it's still a buyer's market, and likely to remain so for another month, the National Association of Purchasing Agents is not pessimistic over the outlook. It expects that second quarter orders will be better than in the first quarter, and foresees lower inventories. However, no price increase in basic steel is foreseen. The chairman of U. S. Steel likewise sees a slightly better trend in the order picture and looks for a better second quarter for the industry. He does not believe that customers can get along on less steel than they have now. The economy is going to use more steel than has been ordered. In his opinion, consumer reductions of inventory have been going on for 8 or 9 months, reducing stocks to less than 10 million tons, down from a peak of 18 million tons in April, 1960.

New Capital Spending To Exceed \$1.2 Billion

In spite of the slow 1961 start, plans for new plant and equipment spending this year total up to over \$1.2 billion, according to the American Iron & Steel Institute. It now appears that the 1961 outlook for exports of steel is better than for imports. This reversal of last year's situation has been caused by strong European demand, which has resulted in some Continental steel companies asking to be notified if their American representatives cannot sell all the steel allotted for import into the U. S. This steel can be sold abroad.

Copper Price Remains Firm

While domestic demand for copper and copper products is no more than fair, earlier fear that the price

of the metal would display further weakness has largely been dissipated. This feeling of confidence results from several factors. Production cutbacks totalling 22,000 tons a month have been announced by important copper mines here and abroad. If fully implemented, these would reduce world output below the average monthly deliveries to fabricators in 1960 of 300,000 tons a month, and bring down the present high level of world refined stocks.

African Situation May Unsettle Output

A second factor has been the unsettled Congo and Rhodesian situation that could conceivably result in interference with normal copper output from the mines. These two countries account for about 25 per cent of the world's copper supply. Consideration of this has caused the London price of copper to advance to 28 cents a pound. At this level there is no profit in exporting copper to this country after paying tariff of 1.7 cents a pound. Copper scrap advanced $\frac{1}{2}$ cent a pound in mid-February. The strength of the scrap market is usually a good augury for continued stability of electrolytic metal.

Business Depressed For Brass Fabricators

Business with the brass fabricators has been hurt by poor demand and severe weather that has disrupted deliveries and shipments. Cost cutting and plant layoffs continue. The best opinion in the trade is that domestic fabricators have lost an uncomfortable portion of their business to competing materials. Imports from abroad, where lower wage rates prevail, have cost another slice. Indicative of poor demand has been the decision of a

(Turn to page 56, please)

LETTERS

to the

Editor

Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address Letters to the Editor, AUTOMOTIVE INDUSTRIES, 56th &

Chestnut Sts., Philadelphia 39, Pa.

ALUMINUM

The writing by your Markets Editor Norman M. Lloyd titled "Aluminum — Front Runner in Materials Derby," is most complete and instructive.

Would it be possible to secure one extra copy of the issue and six sets of tear sheets for our library and key men?

S. L. Kahn
Technical Processes Division
Colonial Alloys Co.
Philadelphia, Penna.

• Glad to oblige—Ed.

I was very interested in the article on aluminum in the automotive market (January 15), and feel that you have done an unusually comprehensive job in your presentation.

Donald B. McCommard
General Director of Public
Relations
Reynolds Metals Company
Richmond, Va.

CORPORATE IMAGE

Because of Chilton's past gifts to the Thomas McKean Automobile Collection, I thought you might be interested in seeing our new brochure.

In a small way it recognizes our great indebtedness to you.

W. B. Crimmin, Curator
Thomas McKean Automobile
Collection
Free Library of Philadelphia
Philadelphia, Pa.

STEAM CARS

Will you please send me what information you have available pertaining to steam cars, both antique and modern. I am especially interested in obtaining information as to who has restored antique steam cars, or built modern ones in the past few years; their ad-

dresses if possible, and the names of manufacturers of steam assembly components which might be suited for installation in an automobile.

Terrance L. Day
Richland, Washington

• I suggest you contact Mr. L. Scott Bailey, Editor, "Antique Automobile," 46 Perry Street, New York 14, New York.—Ed.

ELECTROLYTIC SHAPING

Reference is made to the following listed article appearing in the December 1 edition of AUTOMOTIVE INDUSTRIES: New Electrolytic Process Shapes Tough Alloys.

As a member of the NATO Group of Experts on Ammunition Manufacturing Techniques, I have been requested by the Chairman of this Group to ascertain if thirty copies of the above listed article might be obtained for distribution at the next meeting in Europe or prior to the meeting, whichever is more satisfactory. Therefore, it is respectfully requested if such copies are available, they be mailed to: Commanding Officer, Frankford Arsenal, Philadelphia, Penna.

If the above reprints are not available, permission is then requested to reproduce the specified number of copies for distribution as stated above. It will be appreciated if you will indicate below if the identified material may be used as intended and when we may expect to receive them.

G. A. Ripkin
Assistant
U. S. Army Ordnance
Frankford Arsenal
Philadelphia, Pa.

• We are pleased to grant you permission to reproduce the specified number of copies for the use stated in your letter.—Ed.

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AIR BRIEFS

By R. Raymond Kay

PACIFIC COAST EDITOR

Defense Contract Shifts

LET'S not make a WPA out of the nation's multi-billion-dollar defense program. That's the cry from the West Coast's congressional members.

The hassle to shift some defense contracts from western to eastern firms is an old one. Almost every recent session of Congress sees a resolution introduced calling for an investigation. Purpose: To find out whether some regions of the country are discriminated against in award of prime defense contracts.

Now along comes Senator Butler's (R-Md) resolution. He says there's "an over-concentration of contracts in California."

The Senator quotes Defense Department's figures that show nearly 28 per cent of its prime contracts for fiscal 1960 went to West Coast firms—most of them to California companies.

The Maryland senator is for greater dispersal of contracts. He claims it's a must on two grounds: (1) Security and (2) Help to areas of great unemployment.

West Coast congressional members don't agree with him. They say defense contracts should go where the work can be done better, faster, and cheaper. They'll fight tooth and nail to keep the business.

Military Contracts in 1960

General Dynamics heads the list of the 100 companies that had the largest dollar volume of military contracts in fiscal 1960. It got \$1.12 billion. Total prime contracts for the 100 companies: \$15.4 billion.

Lockheed ran second with \$1.01 billion. Boeing with \$1 billion was third, followed by General Electric and North American Aviation.

Century 21 Exposition

Feature of the Century 21 Exposition in Seattle in 1962: A Spacearium. It's billed as a "spectacular trip through space." A make-believe voyage will give close-ups of the moon, earth, and planets.

Sponsors of the attraction are the government's U.S. Science Exhibit and Boeing.

Lightweight Motor

North American Aviation has a unique lightweight electric motor. The company says it operates in temperatures from plus 550 deg to minus 65 deg F. Its high temperature range will cope with heating conditions in B-70 flight.

The motor frame is stainless steel. Wiring is encapsulated in ceramic. The design makes use of a new aluminum anodizing method for wire insulation.

600 Jets by '63

The Free World's international flag lines will have 600 pure jets in use by 1963. That contrasts with only 14 in service at the end of 1958.

The 80 airlines which are members of International Air Transport Assn. report that they now have 3500 aircraft in their fleets.

R & D Contracts

During fiscal 1960, the Defense Department gave out \$5.5 billion in prime research and development contracts. Some 500 companies got a piece of this business.

Lockheed Aircraft led the parade with \$666 million, or 12 pct of all awards. The other top five R & D contractors: General Dynamics, \$528 million, 9.5 pct; North American Aviation, \$474 million, 8.6 pct; General Electric, \$397 million, 7.2 pct; and Western Electric, \$270 million, 4.9 pct.

Production of the B-70

North American Aviation is getting its B-70 tooling equipment ready. A full-scale assembly program on the Mach 3 bomber is scheduled for March.

The company is moving the equipment from its Los Angeles to Palmdale (Calif.) plants. Biggest item is the B-70 aft fuselage section jig. It's 45 ft long, 36 ft wide, and 20 ft high.

Mergers of Aerospace Firms?

The rumor factory on the West Coast is operating at a supersonic rate. During the past 10 years, almost every major aerospace firm was named as a possible merger candidate. Nothing ever came out of all this talk.

As everyone knows, the aerospace industry is highly competitive. And it's getting more so every day. But to maintain a strong position in the industry, some companies might be forced to merge.

At least, that's the opinion of Donald W. Douglas, Jr., president of Douglas Aircraft.

He says, "The future strength and vitality of our industry may require closer cooperation or outright mergers. And it may be necessary to recognize this through amendments to our anti-trust laws."

Mr. Douglas points up that the trend has been set by the British aerospace industry.

Nuclear Rocket Engine

"This country is ready to begin work on a flyable nuclear rocket engine. Such an engine will significantly increase the payload capability of space vehicles of the current decade." That's the way T. F. Dixon sees it. He's vice-president, Research and Engineering, Rocketdyne Div. of North American Aviation.

Mr. Dixon says nuclear rocket en-

(Turn to page 56, please)

INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	Feb. 18	Feb. 11	1961	1960
PASSENGER CAR PRODUCTION				
Total—American Motors	9,577		34,912	71,324
Chrysler		2,201	11,979	17,401
De Soto			9,588	
Dodge	784	3,262	12,732	60,203
Imperial		323	1,126	4,367
Lancer	420	844	3,630	
Plymouth	1,359	4,003	19,110	60,616
Valiant	1,111	2,679	11,970	34,982
Total—Chrysler Corp.	3,654	13,612	60,147	187,067
Comet	2,961	2,321	13,800	586
Falcon	8,787	7,499	50,488	75,571
Ford	10,063	11,926	103,677	213,482
Lincoln	673	777	5,421	5,261
Mercury	1,199	2,046	10,726	34,644
Total—Ford Motor Co.	29,683	24,571	184,122	329,634
Buick	631	3,483	24,294	55,078
Buick—Special		1,099	9,173	
Cadillac	3,386	3,396	23,019	28,844
Chevrolet	22,641	20,720	161,607	270,578
Corvair	7,811	8,961	44,032	55,797
Oldsmobile	890	4,866	32,086	71,221
Oldsmobile—F85		1,825	10,404	
Pontiac	899	4,442	31,801	71,871
Tempest		2,564	17,026	
Total—General Motors Corp.	36,260	48,836	384,287	554,490
Total—Studebaker-Packard Corp.	1,287	128	7,063	22,088
Checker Motors	126	128	862	832
Total—Passenger Cars	76,842	88,375	841,063	1,165,432

TRUCK AND BUS PRODUCTION

	1960	1961	1960	1961
Chevrolet	5,658	5,646	40,906	75,530
G. M. C.	1,270	1,364	8,930	17,065
Diamond T	20	27	175	502
Dive	60	60	348	560
Dodge and Fargo	1,370	1,290	8,300	13,224
Ford	6,792	7,580	46,043	56,781
F. W. D. Corp.	25	17	129	168
International	2,563	2,833	17,247	26,400
Mack	167	194	1,313	2,316
Studebaker	131	214	771	1,200
White	327	326	2,188	2,630
Willys	2,711	2,568	13,082	17,776
Other Trucks	70	70	490	706
Total—Trucks	21,223	22,218	139,930	212,066
Buses	40	45	435	626
Total—Motor Vehicles	97,806	110,636	781,448	1,378,128

1960 NEW REGISTRATIONS*

Arranged in Descending Order According to the Twelve Months, 1960 Totals

NEW CARS

Make	December	November	December	Twelve Months	
	1960	1960	1960	1960	1960
Chevrolet	145,107	134,018	98,324	1,086,925	1,410,131
Ford	119,523	124,848	127,188	1,420,352	1,471,249
Plymouth	30,272	34,105	26,773	445,580	390,104
Rambler	21,883	31,341	31,212	422,273	383,372
Pontiac	36,205	31,904	19,199	399,646	382,137
Dodge	22,296	25,272	19,434	356,572	187,277
Oldsmobile	34,446	34,361	16,188	356,798	380,525
Buick	27,526	29,147	14,678	267,837	245,809
Comet	15,837	17,926		157,815	
Mercury	13,455	13,293	13,843	180,724	157,872
Cadillac	14,296	14,203	8,354	149,583	135,387
Studebaker	7,333	7,537	11,866	106,244	133,382
Chrysler	7,799	7,353	5,894	79,752	64,424
De Soto	1,126	1,194	2,327	23,063	42,488
Lincoln	2,783	1,175	3,211	20,711	25,815
Imperial	1,512	1,733	1,585	16,360	18,496
Misc. Domestic	848	360	3,422	8,910	46,474
Foreign	32,334	32,479	54,930	496,785	614,131
Total—All Makes	544,278	543,042	430,830	6,576,650	8,041,275

NEW FOREIGN CAR REGISTRATIONS*

DECEMBER		
Volkswagen	15,523	15,486
Renault	2,450	8,165
Mercedes Benz	1,205	3,512
Opel	1,080	3,192
Triumph	945	2,829
Flat	906	2,106
Volve	901	1,743
Simca	804	1,706
Austin Healey	752	1,496
English Ford	719	1,495
All Others	7,049	13,096
Total	32,334	54,930

TWELVE MONTHS

1960		
Volkswagen	158,995	120,442
Renault	62,772	91,073
Opel	25,533	42,512
English Ford	23,602	39,802
Fiat	20,773	38,468
Triumph	17,720	35,190
Simca	17,077	28,185
Austin Healey	16,322	23,476
Mercedes Benz	14,435	23,072
Volve	13,926	18,533
All Others	128,630	153,378
Total	488,785	614,131

TRACTOR SHIPMENTS

WHEEL TYPE

Hp Ratings	December	Twelve Months
9-34 belt hp.	1,825	25,716
35-39 belt hp.	1,529	21,959
40-49 belt hp.	2,229	31,319
50-58 belt hp.	4,423	41,172
60 belt hp. and over	4,384	30,449
Total—Wheel Type	14,470 ¹	150,615 ²
TRACKLAYING TYPE		
20-39 net engine hp.	688	7,986
60-129 net engine hp.	488	7,894
130 net engine hp. and over	424	8,031
Total—Track Type	1,000 ³	23,911 ⁴

¹—Valued at \$38,432,000

²—Valued at \$15,771,000

³—Valued at \$341,092,000

⁴—Valued at \$274,894,000

NEW TRUCKS

Make	December	November	December	Twelve Months	
	1960	1960	1960	1960	1960
Chevrolet	25,802	24,870	13,651	316,962	306,237
Ford	22,093	15,832	21,631	280,501	292,931
International	7,563	8,418	9,460	110,348	109,053
G. M. C.	8,975	8,418	3,910	82,546	69,509
Dodge	3,820	3,995	3,011	43,606	52,278
Willys Truck	2,182	1,804	2,668	19,930	20,260
White	878	787	1,262	14,179	15,487
Willys Jeep	1,330	1,101	1,348	11,455	10,804
Mack	729	709	942	10,878	13,473
Studebaker	522	689	232	5,932	5,908
Diamond T	106	133	273	2,421	3,008
Brockway	97	89	111	1,103	1,196
All Others	2,993	2,997	3,383	43,825	42,179
Total—All Makes	73,250	67,477	62,092	943,485	942,133

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

News of the MACHINERY INDUSTRIES

By Charles A. Weinert

Lake Erie Machinery Corp. Makes Big "Bulldozer"

A big horizontal forming press, reputed to be the largest of its type ever built, has been delivered by Lake Erie Machinery Corp. to the LeTourneau-Westinghouse Co.

Commonly known as a "bulldozer," the hydraulic press will be used by the Adams Division of LeTourneau-Westinghouse at Indianapolis to form frame members and other structural components for giant earthmoving equipment.

Weighing 400,000 lb, the bulldozer has a ram travel of six feet and a total ram pressure of 2550 tons. The machine actually is composed of three 850-ton presses arranged side by side. Provision is made for working the three units simultaneously, or for operat-

ing each one independently. Track mounting allows movement to different locations in the plant.

The machine is 20 ft wide when the three presses work in unison. Length is 27 ft and height is 12 ft. Each unit has a 60-hp motor, and each motor drives an Oilgear 44.6 gpm pump.

Government Studies World's M-T Industry

The U. S. Dept. of Commerce will soon release the first of a series of important reports on the status of the world's machine tool industry and where the U. S. stands in it.

The first report, on world-wide machine tool operations, is expected to be ready within the next few weeks.

The report, being handled by the

**Lake Erie Machinery Corp.
Delivers Large Horizontal
Press to LeTourneau-West-
inghouse at Indianapolis,
Where It Will Be Used to
Form Earthmoving Equip-
ment Components**

Metalworking Equipment Division of BDSA, will cover the activities of principal machine tool countries. Both of exports and production are being surveyed.

BDSA officials believe these studies will be a "tremendous management guide." They think that by analyzing the buying and selling of machine tools throughout the world, the reports will be valuable to U. S. machine tool producers.

The first study will cover world-wide machine tool operations through 1958. BDSA officials say this report will be up-dated next year.

The second report in the series is expected to cover factors associated with the problems of the U. S. machine tool industry.

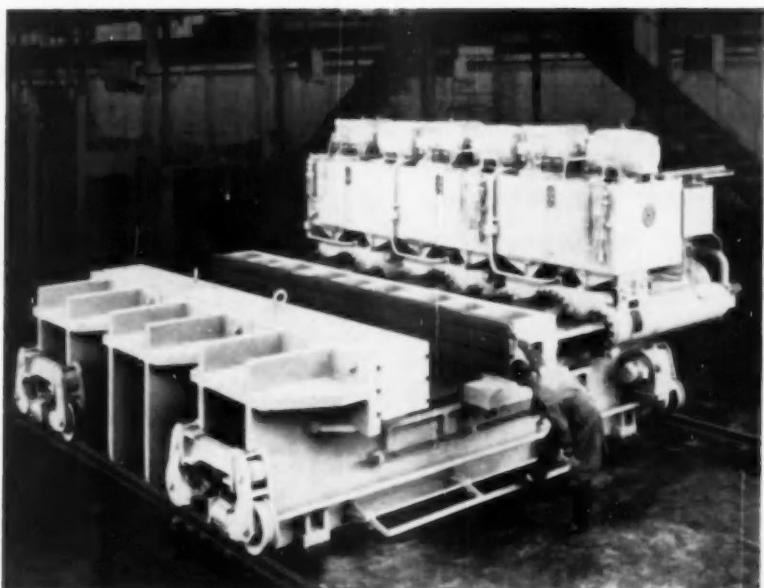
Tax Depreciation Report Released by MAPI

Machinery & Allied Products Institute has just published a four-page report on depreciation policies which "dramatically documents the disparity between tax depreciation here and abroad."

Comparisons of the depreciation allowances on production equipment in the United States with those in Great Britain, Canada, West Germany, Sweden, France, Italy, and Japan are viewed. The report indicates that:

In two of the overseas countries (Japan and Great Britain) the first-year writeoff exceeds 50 per cent of cost. In two others (Sweden and Italy) it exceeds 30 per cent. The figure for the U. S. is 13 per cent.

Two countries (Great Britain and Sweden) permit a recovery of more than 70 per cent of cost in



Lake Erie's big horizontal forming press, built for LeTourneau-Westinghouse Co., weighs 400,000 lb and has a total ram pressure of 2550 tons

the first three years of service. Two others (Japan and Italy) allow over 60 per cent. The American equivalent is 35 per cent.

Only one country (West Germany), among the group studied, is in the U. S. category. The report points out, however, that this particular situation had a recent cut-back, after a period of greater liberality, as a brake on what was considered excessive investment activity.

The complete report is available from Machinery & Allied Products Institute, 1200 Eighteenth St., N. W., Washington 6, D. C., at 25 cents per copy.

Bliss Obtains Order For Automotive Presses

An order for nine large metal-working presses, priced at over \$1.25 million, has been placed by a major automotive manufacturer with E. W. Bliss Company's Press Div. at Hastings, Mich., according to the press manufacturer.

The order includes presses of two-point and four-point slide suspension, and capacities of 600 and 800 tons. The presses are single-action machines of the link type, under-drive design.

Robert Shannon, Press Division manager, says the machines will be built at the Bliss plant in Salem, Ohio.

Around the Industry

Nebel Machine Tool Corp.—has moved manufacturing, engineering and purchasing operations to a plant at 600 N. Third St., Hamilton, Ohio, which includes 28,000 sq ft of production space. Sales and service offices remain at 3372 Central Parkway, Cincinnati.

Van Norman Machine Co.—has taken over the sale and manufacture of the "Magna Drill," a multi-purpose drilling and tapping machine. It will be marketed by Van Norman under the name "Versi-Matic."

Grotnes Machine Works, Inc.—as a means of demonstrating the capabilities of Grotnes expanders and plannishers, is offering to product manufacturers the use of machines in its plant for making

Meet the AI By-Liners



A brief biographical sketch of the editors and contributors to AI whose by-lines appear regularly

Introducing David Scott

David Scott, London-based European correspondent, has been contributing to *AI* since 1951. During the past decade he has visited and reported on the production highlights of most of the leading vehicle and engine factories in Britain, France, Germany and Holland, and has several times probed automobile industries behind the iron curtain in Czechoslovakia, Poland and the U.S.S.R.

In a pioneering motor trip to Russia in 1957 he became one of the very first westerners to reach Moscow by car, and was the first technical journalist from the outside world to inspect and photograph the production lines of Soviet car plants. Scott's reports prompted publication of a special issue of *AI* (January 1, 1958) devoted to the Russian automotive industry.

Scott's "European Roundup" is a monthly feature, and several of the annual car, truck and air shows in Europe are regular fixtures on his calendar.

Scott is a graduate of Tusculum College, Greeneville, Tenn., where he majored in physics for a B.A. degree while editing the college newspaper for his first experience in journalism.

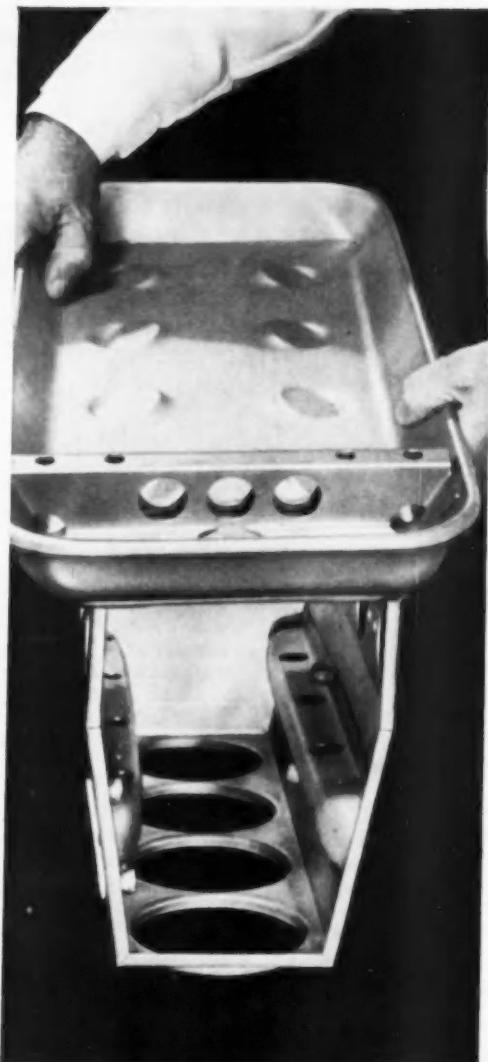
Just before Pearl Harbor he received a direct commission in the U.S. Army Signal Corps to work in radar, with the accent on mobile equipment. He spent three years overseas, and by the end of the war had acquired a British bride and the rank of captain.

A promising job in electronics with Raytheon followed, but Scott's urge to write and travel took him back to Europe for a period of free-lancing. He settled in England, did three years' graduate studies at the London School of Economics, then established himself in industrial journalism on a full-time basis. An early leaning towards cars quickly led him to specialize in that field and to membership in the Guild of Motoring Writers. Hobbies are photography (he illustrates many of his stories himself) and jazz piano.

trial runs of finished parts.

National Twist Drill and Tool Co.—William E. Atchley has been elected vice-president in charge of sales; and Fred D. Lamb, Jr.,

appointed general sales manager. Howard M. Easton is now assistant general sales manager. Rex F. Supernaw also was named chief metallurgist. ■

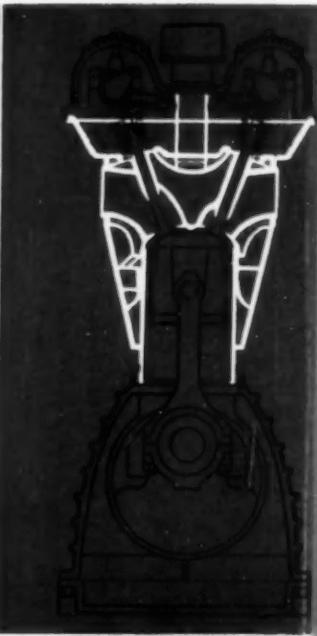
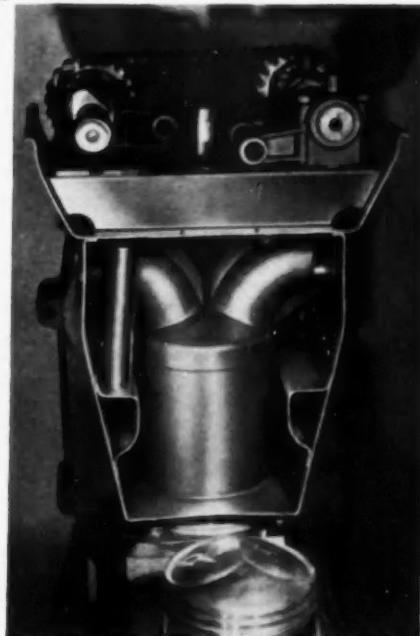


Use this label
to tell customers
where you use durable,
modern stainless steel.



Cylinder block sections formed from Type 302 stainless are joined by spot-welding and copper brazing. Coolant galleries, cylinders and cylinder heads, valve pan, intake and exhaust ports are made from stainless steel.

How Armco Stainless Steel Put 175 "Horses" in





This Tyce-Taylor "TnT" Engine, produced by Tyce Engineering Corporation, Chula Vista, California, is for marine use. Similar 4-cylinder models power racing and sports cars. Depending on stroke, this compact power plant can generate from 115 to 175 horsepower, developing maximum output at 6500 rpm. Weight in all displacements is about 175 pounds, dry weight.

s Steel Sheets Help Tyce s' in 175-Pound Package

One horsepower per pound—that's what Tyce Engineering Corporation packs into its new "TnT" Engine. A cylinder block assembly formed from Armco 18-8 Stainless Steel sheets is a prime feature of its lightweight construction. Uniformly thin walls speed cooling, minimize "hot spots" and pre-ignition, permit 14:1 compression ratio on regular gasoline. Heat resistance and corrosion resistance of Armco Stainless Steels add durability.

From engine parts to wheel covers and trim, Armco Stainless Steels offer multiple benefits in automotive applications. Data on more than 50 Armco Stainless grades are quickly available from your nearest Armco Sales Office; or mail the handy coupon.

Armco Division
Armco Steel Corporation

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Armco Division

METALS

(Continued from page 48)

New England brass fabricator to lower prices for most orders of 20,000 lb or less of strip and coil, in an effort to stabilize brass mill product prices.

The proposal of Senator Mansfield for an international copper conference to stabilize world prices and production has met scant approval from domestic producers, who foresee trouble from the Justice Department for any suggestion of a cartel, in spite of assurance that the Administration may lend support to the proposal.

No Improvement In Aluminum Demand

February showed little improvement in aluminum demand. Output of primary metal has been curtailed to the current shipping level. As a result, the output of the six primary producers is averaging no more

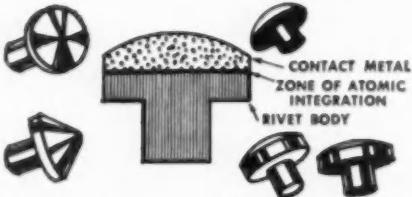
than 75 per cent of their full potential and probably does not exceed 160,000 tons a month. This would indicate a cutback of some 7000 tons below the peak of last July. With top heavy inventories of close to 270,000 tons, it is obvious that some curtailment was urgently needed. The situation parallels in a general way the position of zinc, lead, and copper producers. While consumer stocks are believed to be very low, it seems unlikely that users will come into the market with solid buying until there are definite signs that the current business recession is over. This will probably occur around midyear, maybe earlier. Aluminum demand in the past has usually revived before a general upturn can be pinpointed in industry. Some observers have pointed out the cyclical pattern for ingot and billet shipments, up in 1957, down in 1958, up in 1959, down in 1960. This could suggest that 1961 could turn out to be a good year for the metal.

Aluminum secondary smelters admit that deliveries to their customers are running about 30 per cent less than in the first quarter of last year and they do not foresee any general pickup before May. Price cuts in many products have not brought in larger orders.

Good Outlook for Foil

At least one segment of the industry is optimistic. Sales of aluminum foil are expected to increase 5 per cent in 1961, with shipments estimated to exceed 255 million pounds. Prices are relatively firm. Tough competition is expected in the container field, where the new thin steel plate is getting a favorable reception. But aluminum cans will account for over half of Florida's frozen juice pack and producers are next prepared to make inroads in the canned seafood industry. Profits are meager because of severe competition, with margins of 4 to 6 cents a pound for canning sheet over the price of primary ingot.

NEW! Improved electrical contacts at drastically lowered cost!



FACING STYLES A new process provides solid bonding by atomic integration of contact face metal and the rivet body, with superior electrical and mechanical bond. It permits substantial economy of precious metal by limiting its area and thickness to actual electrical and mechanical requirements of the contact, and ranges from a thin, centered ellipse to complete envelopment of the rivet head. The entire rivet may be silver-plated at no extra cost.

Made in flat, radius, full crown or conical face of either precious or semi-precious metals. Shanks may be solid, indented or tubular; of copper, steel or other base metals.

GIBSON ATOMICLAD* CONTACT RIVETS PLUS VALUES

- Contact facing is bonded directly and is integral with the rivet body without any contaminating layer of brazing material or flux.
- Better electrical, mechanical and thermal capacities.
- Surfaces are work-hardened through elimination of the annealing effect of brazing heat.
- Contact facing thickest where wear is greatest.
- Reduced bounce and chatter because of lower elasticity of copper body.
- Lighter weight an assist in delicate assemblies.

*ATOMICLAD—Trademark Gibson Electric Company

GIBSON ELECTRIC SALES CORP.

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DETROIT LOS ANGELES NEW YORK PHILADELPHIA PITTSBURGH
ROCHESTER ST. LOUIS SAN FRANCISCO SEATTLE

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Since 1933

CLASSIFIED ADVERTISEMENT

WANTED: OBSOLETE PACKAGING MATERIALS — CORRUGATED CARTONS, FOLDING BOXES, BAGS, POLY AND CELLOPHANE ITEMS, ETC.
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SILICOLOGY

Studies in Silicones

HOW THESE TIME-TESTED MATERIALS
CAN WORK FOR YOU

Silicones Go Into High Gear... To Back Up the New Car Warranty

Automobile designers sharpened their pencils for the 1961 models. The new "12-months-or-12,000-miles" warranty calls for much more than a new piece of paper. Needed is the kind of extra assurance that products such as silicones provide to back up performance.

With this new look at quality control, UNION CARBIDE Silicones are becoming more popular with designers, production engineers, dealers, and most important, with customers. Yet these high-performance products usually cost only a few cents more than most of their out-dated counterparts.

SILICONE RUBBER SETS NEW STANDARDS

Silicone Rubber, in various compounds, performs better than organic rubber in many areas. Among other things, it stands up under extremes of heat and cold, yet permits precision molding at favorable fabricating rates.

Silicone rubber sparkplug boots remain unaffected by water, heat—even ozone—for a maximum service life. Other compounds work just as well as dielectric coating on battery terminals and distributor caps. And a special electrically conductive silicone rubber is used as ignition wire core on many models, reducing car radio interference below annoying levels. In transmissions and differentials, silicone rubber seals and gaskets stay on the



CLOSE-UP of compact engine in Chrysler Motor's new 1961 Valiant series.

job in spite of attack from oil, hydraulic fluids, anti-freeze—under conditions of elevated temperature.

LOOK WHAT SILICONE FLUIDS CAN DO

There are an amazing number of places where silicone fluids work to reduce production costs and to boost the performance of the finished car. We can mention only a few.

To begin, silicone anti-foams in coolants and cutting oils keep costly, efficiency-robbing foaming of these agents to a minimum. In the production of tires, rubber floor mats, molded rubber accessories and radiator hoses, there are

silicone release agents which help the finished product slip easily and quickly from intricate molds without loss of detail.

In the car itself, silicone damping fluids frequently keep delicate instruments from bouncing around, even when road conditions are extremely rough. In certain cars, variable-speed drive systems for the cooling fans use silicone fluids for powering because these remain stable over wide ranges of temperature. Among other things, silicone fluids are excellent leveling agents for acrylic lacquers . . . all-weather lubricants for car weatherstripping . . . and excellent constant-viscosity lubricants in special applications.

MORE TO COME FROM RESEARCH

There are hundreds of other ways in which silicones are serving the automotive industry. Every day, new uses are coming from research; more are being developed in the laboratory. Perhaps there is a place where your own operation can use them profitably, to improve product performance and production efficiency. We suggest you send the coupon below for further information related to your specific needs.



SILICONES

UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

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THE 1961 VALIANT Two-Door Hardtop, a new model in Chrysler Motor's Compact Car V-200 series, uses Silicone Products in many areas to improve the reliability, durability, and reduce production costs.

NEW PRODUCTION and PLANT EQUIPMENT

By C. J. Kelly
ASSISTANT EDITOR

Liquid Gas Filter

Liquid gases such as nitrogen are normally difficult to filter because of the low temperature and thermal shock conditions which are involved. In filtering these gases a filter must be suitable for both liquid and gaseous nitrogen and be able to withstand pressures and flows without requiring excessive down time for cleaning. To answer these problems

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

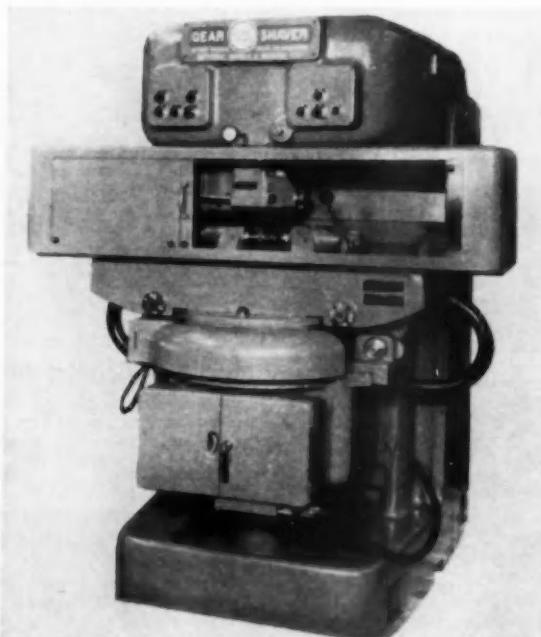
Purolator has developed a new filter unit which can stand 150 psi operating pressure even though the normal operating pressures are maintained at about 75 psi. This new filter can process 10 tank car loads of liquid nitrogen at 10 microns or less before a differential pressure of 25 psi necessitates cleaning. *Purolator Products, Inc.*

Circle 30 on Inquiry Card for more data

Gear Shaving Machine Features New Cutter Head Design

THE new cutter head on this unit is designed so the shaving cutter nut is loosened or tightened with the outboard support bearing in place. This avoids the possibility of bending the cutter shaft or brinelling the bearings when tightening or loosening the cutter nut with a wrench. Five pre-loaded ball bearings are used to support the cutter shaft in the head. A duplex arrangement is used at the rear and a triplex at the front of the shaft.

The new cutter head is made in two sizes that accommodate either 9-in. maximum or 12-in. maximum diameter cutters. The head is utilized on improved models of Red Ring Model GCU-8, 12 and 18-in. gear shaving machines. The Model GCU is a universal machine that permits both conventional and diagonal shaving operations to be performed in conjunction with an automatic differential upfeed mechanism. *The National Broach and Machine Co.*

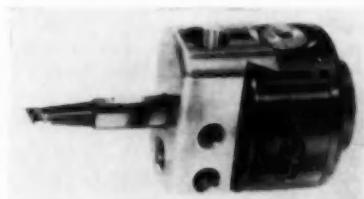


A new and exclusive cutter head design is featured in improved models of Red Ring gear shaving machines for finishing the tooth surfaces on spur and helical gears up to 18 in. pitch diameter. The cutter heads have been designed to provide long wear life, positive ball bearing preloads, maximum ease of cutter installation and freedom of rotation.

Circle 32 on Inquiry Card for more data

Adjustable Boring Head

An all-new boring head is precision constructed and offers such features as three boring bar holes, dial screw graduations for direct reading and interchangeable shanks. To simplify and speed set-ups the boring head has two vertical boring bar holes plus a cross hole for exacting tool positioning and holding. Tools



are locked into position by lock screws.

A completely enclosed dial screw provides accurate adjustments which are directly read from the micrometer dial. To assure precision quality, the threads are ground after hardening. The manufacturer guarantees the dial screw against breakage for the life of the tool. The satin finished boring heads are packaged in a permanent plastic housing suitable for toolroom storage. *Lido Tools*.

Circle 31 on Inquiry Card for more data

Heliweld Holder

A HIGH amperage air cooled tungsten-inert-gas holder has been made available to industry. Known as the Aircos H16-A, the device has 160 amper AC or DC continuous capacity. A feature of the holder is the 2% in. head which is designed to allow clearance in confined spaces. The air-cooled construction eliminates the need for a water system. The H16-A will accommodate tungsten electrodes from 0.020 through 5/32 in. dia., and from 2 to 7 in. in length. Argon, helium, or mixtures of argon and helium shielding gases can be used. *Air Reduction Sales Co., a Div. of the Air Reduction Co., Inc.*

Circle 33 on Inquiry Card for more data

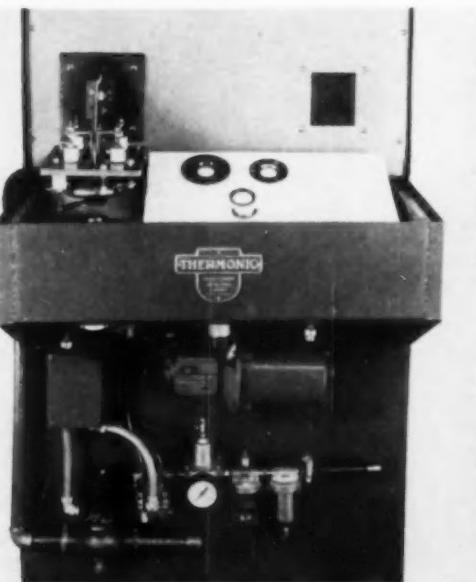
Bearing Races Precision Hardened With New Unit

BEARING races are a particularly "fussy" hardening job. Too much penetration will embrittle the metal in adjacent areas, the heating and hardening must be restricted to hard-to-handle angular portions on each part and, in spite of its narrowness, there must be uniform hardness across the entire angular surface. Hardness generally is restricted, therefore, to an unusually thin surface hardness with a penetration of, say 0.015 to 0.020 in. depth.

To maintain a high production level and virtually eliminate all problems connected with the hardening of bearing races a new unit has been developed. This machine and work coil have been manufactured with such precision it is possible to heat the "working surface" to a temperature of more than 1650 deg F. while the metal only 20 thousandths of an inch away remains cool enough so it will not be hardened. Moreover, power consumption is minimal; only 5 kilowatts of rf energy is sufficient to do the delicate surface-hardening job.

A secondary problem to be con-

Hardening operations are performed on a Ther-Monic model 500 generator, with 5 KW output, and with a heating cycle of 2.2 seconds. Quenching time is 2 seconds. The complete job is done under 5 seconds.



sidered in this heating operation is securing absolute uniformity of the heating. This is accomplished by first leading the work fixture away from the work-coil. The fixture is designed to raise and lower the work at will.

To insure all-over heating, the piece is rotated within the work coil area. The overhead work coil permits introduction of the quench medium from the top. *Induction Heating Corp.*

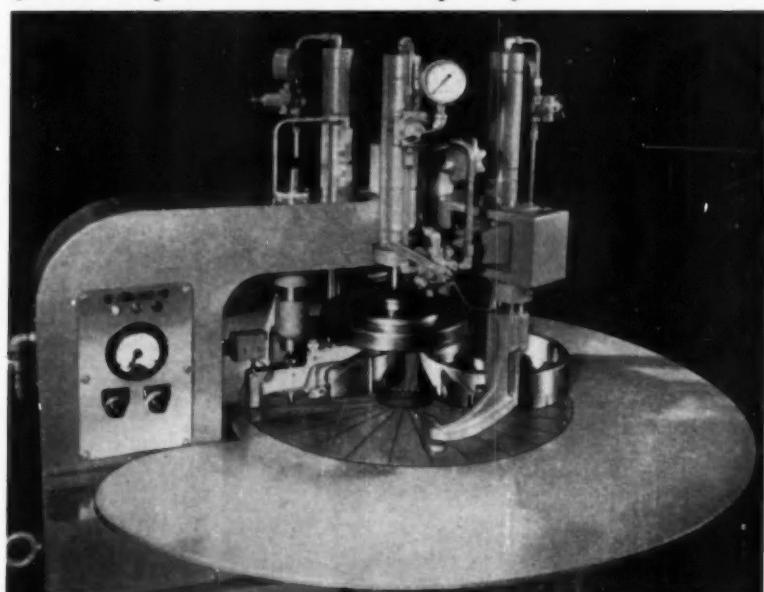
Circle 34 on Inquiry Card for more data

Machine Designed to Lap Parts of Almost Any Shape

WITH a large, wrap-around work table for rapid loading and unloading parts from almost any position, a new lapping machine will lap parts of almost any shape, form or material on a production basis. This unit will operate within tolerances of one light band or less and uniform microinch finishes of 2 to 3.

The new model 24 features an abrasive distribution system which maintains the correct mixture of compound to vehicle and is provided with adjustable flow control. This unit incorporates a fast means of checking and controlling lap plate flatness, insuring uniformity of lapped surface for every piece.

A sensing head, manually brought to rest on the lap plate, automatically detects whether the lap plate is convex or concave, and registers results through lights on the machine's control panel. A single hand wheel then permits simultaneous adjustment of all conditioning rings to compensate for normal wear pattern of the lapping plate. *Crane Packing Co.*

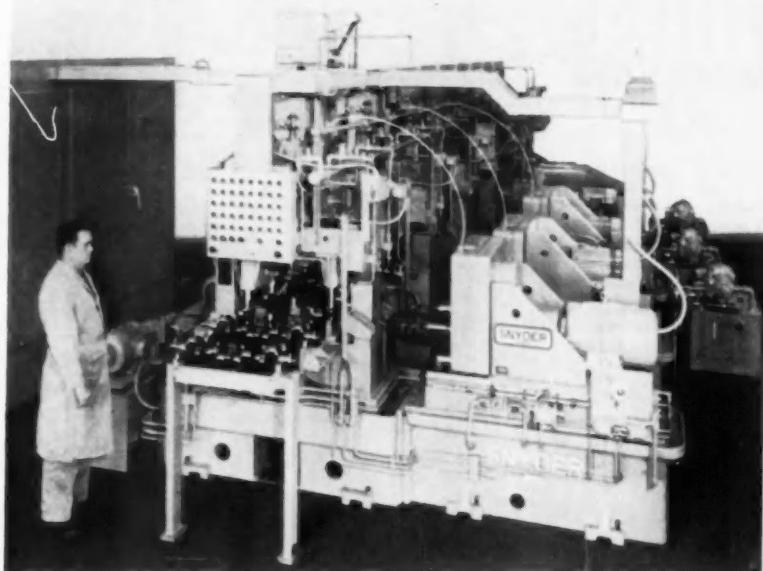


Lapping unit features pneumatic lifts to simplify raising or lowering of the conditioning rings and/or pressure plates.

Circle 35 on Inquiry Card for more data

NEW
PRODUCTION
and PLANT EQUIPMENT

Special 20-Station Building Block Transfer Machine



Special transfer machine occupies a floor space approximately 224 by 404 in.

ACCORDING to the manufacturer this newly developed transfer machine drills, reams, taps, chamfers and precision bores 78 automotive engine crankshafts per hour at 100 pct efficiency.

The new 34 ft long machine is

made up of five separate machining segments and a motorized chip conveyor. The forged steel crankshafts are fed through the machining units by a walking-beam type of transfer mechanism. The parts rest on vee blocks at the two outer main bear-

ing positions. Hydraulically operated overhead vees clamp the parts in each work station. Endwise location is made by a locator at the No. 3 main bearing position. Radial location of the part is accomplished by an approximate locator on the No. 1 pin and a hydraulically-operated clamping vee.

Of particular interest in this machine are the rough and finish precision boring operations on the center hole in the crankshaft flange which are performed at Station Nos. 18 and 19. For these machining operations, the parts, rather than the boring tools are rotated. This assures absolute concentricity between the center hole and the main bearings on which the crankshaft rests.

An in-process gaging operation that probe-checks six holes for completeness or broken drills with a hydraulically operated probing plate is provided at the eighth station. The machine is made up of a series of welded steel machine center bases and Snyder standard cast iron wing bases and way-type slide units with hardened and ground steel ways. The milling heads are mounted on a standard counterweighted column. *Snyder Corp.*

Circle 36 on Inquiry Card for more data

Universal Press Feeder for Single Pieces



Developed for both short and long runs, a new electrically driven press feeder features a continuously adjustable rate from 0 to 3600 pieces per hour. It will handle work-pieces up to 8 lbs and has an adjustable vertical lift from $\frac{1}{4}$ to 3 in. Provision is made for the use of an electric eye to stop the press automatically if the part has not been ejected from the die. *Special Machinery Co.*

Circle 37 on Inquiry Card for more data

Nuclear Gages

A NEW line of nuclear gages for non-contacting thickness-density measurement and process control has been announced.

The basic gaging unit, called a Micrometer, differs from beta gages now on the market in that it utilizes a highly specialized technique of scintillation detection developed by Radionics. The detector permits the use of either beta or gamma radiation, extending the range of application from the thinnest tissue paper to a foot of steel or more.

Sensitivities depend on the source selected. Gamma sources, with high penetrating power, allow measurements to within ± 0.001 in. of steel equivalent, while beta sources allow thin sheets and foils to be measured within a few microinches.

The high speed of response—down to 10 milliseconds—permits extremely high speed inspection. For example, with material moving 5,000 feet per minute, thickness change indication can be given before the material has moved one foot.

The extreme stability of the unit



Manufacturers' News

eliminates the need for off-sheet automatic standardization in most applications.

Applications are not limited to thickness-density measurement; and control. The detector shape can be adapted to flaw detection in thick sections—in hot steel blooms, non-ferrous billets, solid propellant rocket engines, etc. Liquid levels can usually be indicated to within one percent of the range being measured. The Micrometer can also be used in dimension gaging, as in the width and/or weights of hot steel slabs, the weighing of small parts, etc. *Radionics, Inc.*

Circle 38 on Inquiry Card for more data

Vernier Scale Attachment

ACCURACY within 0.0002 in. in positioning and relocating points on milling machines, lathes and similar production equipment is provided by a newly developed vernier scale attachment. The vernier is designed to increase productivity and the ability to hold to close tolerances on older machines by providing the means to overcome errors due to backlash and worn lead screws. With this unit, measurement of hole centers and other time consuming locating opera-



tions are eliminated, and compensation is made for machine setting errors.

Easily mounted on a wide line of machinery, the Evertrue vernier is available for table lengths from 1 to 15 ft and is adaptable for one, two or three-axis operations. SIP engraved scales supply permanent accuracy and the vernier unit rotates for best and most efficient reading position. Simple to read, the unit tends to reduce the need to squat or stoop when reading table position. *Edgcomb Engineering and Engraving Co.*

Circle 39 on Inquiry Card for more data

Moving Bolster Press Line

(Continued from page 43)

the press can be re-started without any of the usual maintenance procedures—such as replacing shear pins or shear plates, for one example.

Based on the early experience with this press line, Fisher Body management is convinced that the new principle makes for highly efficient short run production. As a matter of fact, we learn that several press lines incorporating the same philosophy have been installed or will be installed in other Fisher Body press shops.

Material handling through the press line is mechanized to an extent but is not the automatic handling that might be expected. The reason for this is that full automaticity for the line is neither practical nor economical when handling a variety of different parts. In brief, all loading operations are manual and require an operator. Unloading of the stamping at the back of each press is by means of the familiar iron hand. The hand drops the stamping onto a belt conveyor which carries the part to the front of the next press where the operator picks the piece off the conveyor and loads it into the die. ■

U. S. Rubber Expansion

United States Rubber Co. has announced plans to spend \$6 million over the next five years to modernize and expand its Los Angeles tire facility. G. Raymond Cuthbertson, vice president and general manager of the Tire Div., said the expansion would enable the West Coast plant to meet future needs of the Los Angeles area.

A-C Plans Tractor Plant

Allis-Chalmers Mfg. Co. plans to convert the building housing the former No. 2 foundry at West Allis, Wis., into a tractor production facility. Conversion of the building is expected to start in the spring. Installation of a welding department, machinery operations area, hydraulic pump department, and shipping and loading areas are expected to be completed by the end of 1961.

B-W Earnings Drop

Reflecting the unfavorable business conditions, 1960 sales and earnings of Borg-Warner Corp. totaled \$586.8 million, compared with \$649.8 million in 1959, an all-time high. Net income last year was \$27.2 million, equal to \$3.01 a share, against \$39.3 million, equal to \$4.36 a share, in 1959. Stockholders' equity rose to \$338.5 million, or \$36.81 a share, from \$330.9 million, or \$35.81 a share. The lower earnings were attributed to reduced prices, higher wage and material costs, and curtailed demand.

Construction Industry Trends

(Continued from page 37)

construction rose 2.2 per cent in the third quarter of 1960, as compared with the second quarter. The third quarter figure was still 0.5 per cent below the level of a year earlier.

The indices point up clearly what earthmoving machinery has done for overall construction costs of highways. With 1946 costs as a base of 100, prices are broken down as follows:

	3rd quarter, 1960	2nd quarter, 1960
Excavation	111.2	106.6
Surfacing	147.9	146.8
Structures	146.0	141.5
Composite price index	136.6	133.7

NEW

PRODUCTS

AUTOMOTIVE - AVIATION

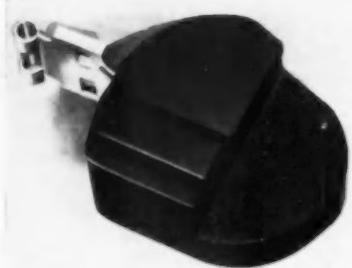
FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly

ASSISTANT EDITOR

Carburetor Float

A new automotive carburetor float, molded from a hard cellular elastomer compound, is said to eliminate problems of improper fuel level caused by leaky or damaged floats. The new chemical material is a solid, closed cell, molded compound which



makes the float leakproof even when a hole is drilled completely through it.

The new float material, called Nitrophyl, is crushproof, chemically resistant to all fuels and additives and is not affected in any way by corrosion. *The Holley Carburetor Co.*

Circle 50 on Inquiry Card for more data

Engine Preheaters

A new thermostatically controlled external tank type electric engine preheater has been developed. Known as the Zero Start, the line has six models from 450 to 2000 watts, in either 115 or 230 volts.

The thermostatic feature of the new model serves as an automatic shutoff should the engine reach preset temperature or should the unit have been improperly installed so as to restrict coolant circulation. With the new Zero Start external tank-type heater, the coolant is warmed and circulated throughout the entire engine by thermosiphon action. This action, the manufacturer states, warms all moving parts of the engine and assures fast starting. *Phillips Mfg. Co.*

Circle 51 on Inquiry Card for more data

gines. The seal is made with oil-resistant synthetic rubber. Made to exacting tolerances, these seals are reported to have good resistance to heat and abrasion. The three components of the seal—a steel torque-loading band, wire spring and chemically treated fabric—are molded and bonded in Chemigum, a synthetic rubber made by *The Goodyear Tire & Rubber Co.* This synthetic is reported to be very satisfactory in this application where other materials failed according to the seal manufacturer, *Brummer Seal Co.*

Circle 52 on Inquiry Card for more data

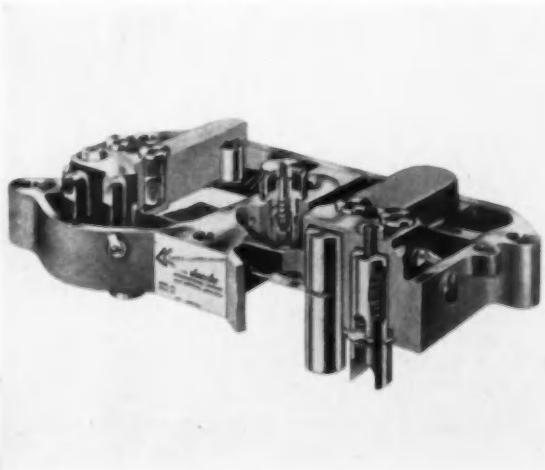
Steering Arm Design



This steering arm was forged as a one piece unit to increase the strength. Having a net weight of 12.43 lb, it was manufactured from 8640 steel. *Union Forging Co.*

Circle 53 on Inquiry Card for more data

New Type Brake for Diesel Engines



Known as the Jacobs Engine Brake a new device has been designed to convert a power producing Diesel engine into a power absorbing air pump that will relieve the braking system of the vehicle to which it is attached of some of its braking responsibility. According to the manufacturer the new type brake will absorb enough energy to keep a 75,000 lb truck under complete control at 15 mph on a 10 pct grade without the use of the service brakes. *The Jacobs Mfg. Co.*

Circle 54 on Inquiry Card for more data

Aluminum Block

A six-cylinder engine with an aluminum block is now available in the 1961 Dodge Lancer. The new power plant is die-cast and is offered only with the 145 hp, 225 cu in model. The aluminum block reduces the engine weight by almost 65 lbs.

Other uses of aluminum by Dodge include aluminum pistons, distributors, oil and water pumps, alternator bodies, intake manifolds, and—more recently—torque converter and transmission castings. *Dodge Div., Chrysler Corp.*

Circle 55 on Inquiry Card for more data

Report from the

FARM EQUIPMENT INDUSTRY

By Kenneth Rose

MID-WEST EDITOR

STUDIES by the Department of Agriculture show that the amount of machinery on the U. S. A. farm has increased from 6 per cent of all physical assets 20 years ago to 10 per cent of all farm physical assets at present. To keep this growth in balance, it should be remembered that the amount of physical assets on farms has increased considerably, so that the 10 per cent is that proportion of a much larger base.

At the same time, it has been shown that most farm machines are used less than they were 10 to 15 years ago. This is probably

due, in part at least, to the greater specialization of farm machinery. The heaviest use is associated with the newer and larger machines and with the larger farms. Average use on farms of 220 acres or more is three to four times the average use on farms of 100 acres or less. Operators of smaller farms tend to do more custom work to spread the ownership costs of expensive machines.

Farm tractors seem to be increasingly long-lived. The life of a farm tractor in the two or three decades before 1940 was about 12 years but since that year the average useful life of the farm tractor has increased to about 17 to 20 years. Furthermore, many of these will pass through the hands of more than one owner. From a third to a half of the farm machines now on farms in the country were bought as used machines by the present owners. Used machines are more likely to be found on the smaller farms, and new machines on the larger.

New Cotton Picker

Allis-Chalmers Mfg. Co. has added another new two-row cotton picker to its line, the second to be

introduced by the company in time for the 1961 harvesting. The new Model 616 is intended to pick cotton of medium height in heavy stands, while the earlier Model 622 Hi-Unit was intended primarily for use in tall cotton.

The Model 616 picker has 2560 chrome plated, recessed barb spindles made of a heat treated alloy steel that rotate continuously while the machine is in the picking area. Each spindle extends through the plant to catch the lint, but the leaves and stems, not entangled, pass through the machine. Because the spindles rotate in self-lubricating bronze bearings, staining of the cotton by lubricating oils from this source is eliminated.

Production Schedules Up

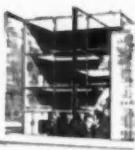
Agricultural machinery manufacturers are increasing production schedules over earlier forecasts as the sales outlook brightens. Allis-Chalmers is doing extra-shift work at its West Allis tractor plant. International Harvester reported putting on more than 2300 employees from the winter's slump, most of these in the farm equipment operations. January's sales still are not tabulated, but it is not expected that they will show much gain. The farm equipment selling season usually starts in February, picks up in March, and tabulated and dependable results are often not available before April. Indications are for a good season, however. ■



New McCormick No. 10 bale thrower

A CHILTON

PUBLICATION

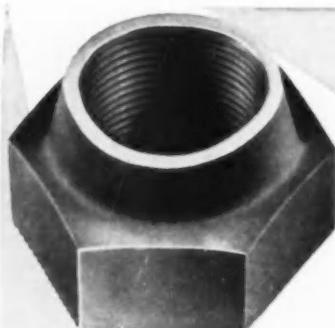


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New One-Piece
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with prevailing torque

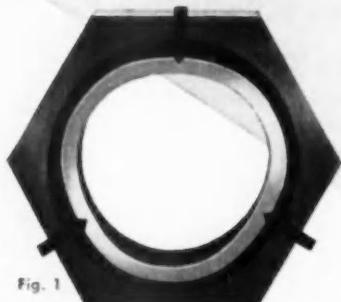


Fig. 1

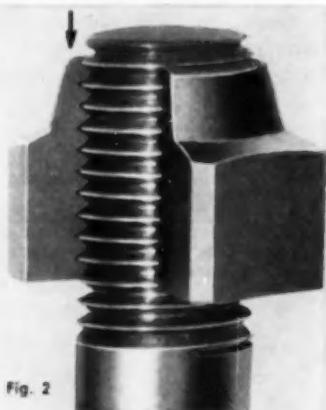


Fig. 2

Three sectors of the tapered portion of the CONELOK nut are preformed inwardly (Fig. 1). When the Nut is applied to a bolt, these conforming sectors are elastically returned to a circular configuration and create an inward and downward pressure which produces intimate contact between the load carrying flanks of the nut and bolt threads (Fig. 2). The shape of the cone sector displacement insures conformity with the mating bolt and maximum friction contact area. . . . The closed stress path in the locking portion of the nut and the advantageous distribution of locking pressure, produce a locking device of high fatigue life . . . and equivalent locking force is exerted at only a fraction of the stress of any slotted type locknut. CONELOK main-

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By C. J. Kelly

ASSISTANT EDITOR

Industrial Cleaning 1

A well illustrated brochure called "Oakite News Service" contains data pertinent to all industrial cleaning operations. It discusses equipment, new products, and shows different cleaning processes. The last three pages are devoted to addresses of the various offices and service representatives from coast to coast. *Oakite Products, Inc.*

Engineer's Data 2

Specification sheet S-1272 discusses latest engineering information on 2 plate clutches. It replaces the type 13E2 specifications shown on page 48-49 in the Borg & Beck Engineer's Manual. New design information and modifications are shown in detail. *Borg & Beck Div., Borg-Warner Corp.*

Numerical Control 3

Numerically controlled engine lathes are described in a new bulletin called "Turn With Tape." The catalog opens up in folder style and contains specification sheets with line drawings and technical descriptions of the various features of the machines. *R. K. LeBlond Machine Tool Co.*

Automatic Machine 4

The model AW, 2½ in. single spindle automatic is described in a new 4 page bulletin. Such features as universal camming, stock feed length adjustment by hand-crank, spindle head, turret, and cross slide construction are described and illustrated. Complete machine specifications are listed. *Cleveland Automatic Machine Co.*

Abrasive Discs 5

A new fiber-backed abrasive disc for lighter grinding operations, where little or no dressing action is involved, is described and illustrated in action in a four page bulletin. A chart and technical data are also shown. *The Carborundum Co.*

Fork Lift 6

Circular 32B describes the new heavy duty Sitdrive model C Spacemaster electric fork lift truck. The 6 page presentation contains illustrations, specifications, and operating characteristics of the new unit. A complete description of the "Inchomatic" drive control system is explained. *Lewis-Shepard Products Inc.*

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Poppet Valves 7

A new illustrated, digest catalog is planned for quick reference to a line of poppet type valves. The line is presented in a single complete chart. Inline and sub-base models are covered. Cutaway drawings show construction features, sealing arrangements, poppets and flow pattern through valves in normal position. Hoffmann Valves Inc.

Molding Machines 9

A six-page bulletin describes and illustrates a complete line of compression and transfer molding machines ranging in capacity from 50 to 1200 tons. Complete specifications on each machine are tabulated and the outstanding operating and design features of each are described in detail. Farrel-Birmingham Co., Inc.

Welding News 10

A 24 page booklet of interesting photographs and articles on welding is available. Called "Hobart Arc Welding News," this publication shows numerous applications, equipment and gives an explanation of the procedures. Hobart Brothers Co.

Stock Products 8

Standard off-the-shelf items are described in revised bulletin G-51a.

The 4-page, 2-color bulletin includes physical properties, recommended applications and current stock sizes of extruded solid rounds, centrifugally-cast bars, extruded rectangles, rolled sheet and plate, die blanks and guide pin bushings. These items are produced from special aluminum bronze alloys which have unusually high resistance to wear, corrosion and fatigue. All items are stocked by the Milwaukee manufacturer and by distributors in principal industrial areas. Ampeo Metal, Inc.

Screw Machines 11

An eight page brochure, "Your present screw machine can be costing you money," gives a detailed comparison between new design Brown & Sharpe automatic screw machines and machines of older designs. It describes capacities and other specifications. Brown & Sharpe Mfg. Co.

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Motors

12

An eight page bulletin gives a comprehensive description of the construction and design details of the new Duty Master fractional hp motor line. Each point is illustrated with photos and drawings, and a life size photo of a cut-away motor is shown in full color. *Reliance Electric and Engineering Co.*

Keyseater

13

The new Star model 25 automatic feed keyseater is described in catalog SC-153. Included are the operating features, specifications, and design features of the line. Tooling, accessories and cutters are also covered. *Star Cutter Co.*

Special Steels

14

Three additional data sheets are available describing characteristics and typical applications of 5 special steels. Designated data sheets 13, 14 and 15, they cover Heppenstall steels numbers R97, T51, and T71-T72-T74, respectively. Shown are instructions for forging, annealing, quenching, and tempering together with hardness data and other information. *Heppenstall Co.*

Copper Strip

15

S-1100-A is the number given a new 12 page bulletin which describes the physical properties and tells how to select the right copper alloy to meet specific application requirements. Five alloys are presented in easy to use tabular form with complete data on properties before and after heat treatment. Also provided are data on properties in annealed, quarter hard, half hard, and hard state. *The Beryllium Corp.*

Jig Borer

16

"Fosmatic Precision Boring" is the name of a new booklet which describes two new jig borers. Models 44 and 54 are completely covered in this 19 page publication. It shows line drawings, illustrations and in addition to technical points it has a specification chart at the back of the book. The different ways the machines can be utilized is also covered. *Fosdick Machine Tool Co.*

Compounds

17

New metal stripping compounds that effectively strip electroless nickel coatings from steel, magnesium base alloys, nickel phosphorous, copper, brass and copper base alloys by immersion only are fully described in a new series of technical data sheets, numbers 119, 120 and 121. *MacDermid Inc.*

Toolroom Grinding

18

A new 32 page booklet entitled Tool Room Grinding contains grinding and sharpening information for tool makers and tool room foremen. Explanatory data regarding grinding wheels includes a description of wheel symbols and markings; factors governing tool room wheel selection; types of bonds used in the manufacture of the various wheels; and wheel structure. Specific wheel recommendations are given for the selection and use of wheels for grinding: milling cutters; offhand grinding; sharpening reamers; hobs; broaches; taps; twist drills; and cemented carbide tools. A separate section covers machine grinding. *The Macklin Co.*

Thread Guide

19

A 15 page publication, called "Harper Thread Guide," was published for the users of Harper corrosion-resistant threaded fasteners. The first page contains a comprehensive introduction written by Mr. H. Harper. The following pages cover numerous types of threads and show a volume of technical and specification data. Line drawings, illustrations, charts and graphs are also included in the booklet. *The H. M. Harper Co.*

Plastic Die Steels

20

The properties and selection of plastic die steels are described in a new booklet which is designed to show die makers how to match die steels to their particular job. A table of mold properties and simplified heat treating instructions has been compiled to facilitate die and mold steel selection. Another section describes new innovations in steelmaking and their potential for offering mold economies on many jobs. *Vanadium-Alloys Steel Co.*

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By C. J. Kelly

ASSISTANT EDITOR

Tooling

21

"Over 25 Years of Advance Tooling" is the title of a 12 page brochure which describes and illustrates recently enlarged facilities, new machines, presses and equipment of the manufacturer, *Advance Die & Tool Co.*

Crawler Tractors

Utility applications of models H-3 and HD-3 are described in an eight page booklet. Also included is illustrated information covering engineering, design and construction features of the recently introduced compact crawlers along with data on its gasoline or diesel power plants, and general specifications covering the new units. Matched equipment that expands on the versatility of the H-3 and HD-3 is also covered in UT-130. *Allis-Chalmers Mfg. Co., Tractor Group.*

Blast Cleaning

Bulletin tells how the Rotoblast impeller unit uses controlled centrifugal force for its blast cleaning power. The revised 8 page bulletin contains diagrams and cut-away drawing showing how the latest design refinements allow these machines to produce quality cleaned surfaces. The bulletin is designated 227A. Pangborn Corp.

REQUEST ON LETTERHEAD

Air Cylinders

Three new bulletins describe and illustrate various types of air and hydraulic cylinders. Cut-away views, line drawings and charts are included to round out all necessary information needed in selecting a specific unit. The bulletins are designated numbers 202, 203, and 204. Please request on company letterhead to: Mo-Bar Hydraulics Co., Crystal Lake, Illinois.

Slide Chart

A simple to use slide chart has been designed to assist design and production engineers in the specifications of Metal-O-Rings. It covers ring diameters from $\frac{1}{4}$ to 50 in. and includes specifications for plain, plated and coated rings. By setting the slide rule at the desired nominal outside diameter for any standard ring the installation diameter can be determined. For non-standard size rings the chart also gives complete data on how to calculate the correct installation dimensions. Please write on company letterhead to: *Mr. Arthur Hostage, Sales Promotion Manager, The Advanced Products Co., 59 Broadway, North Haven, Connecticut.*

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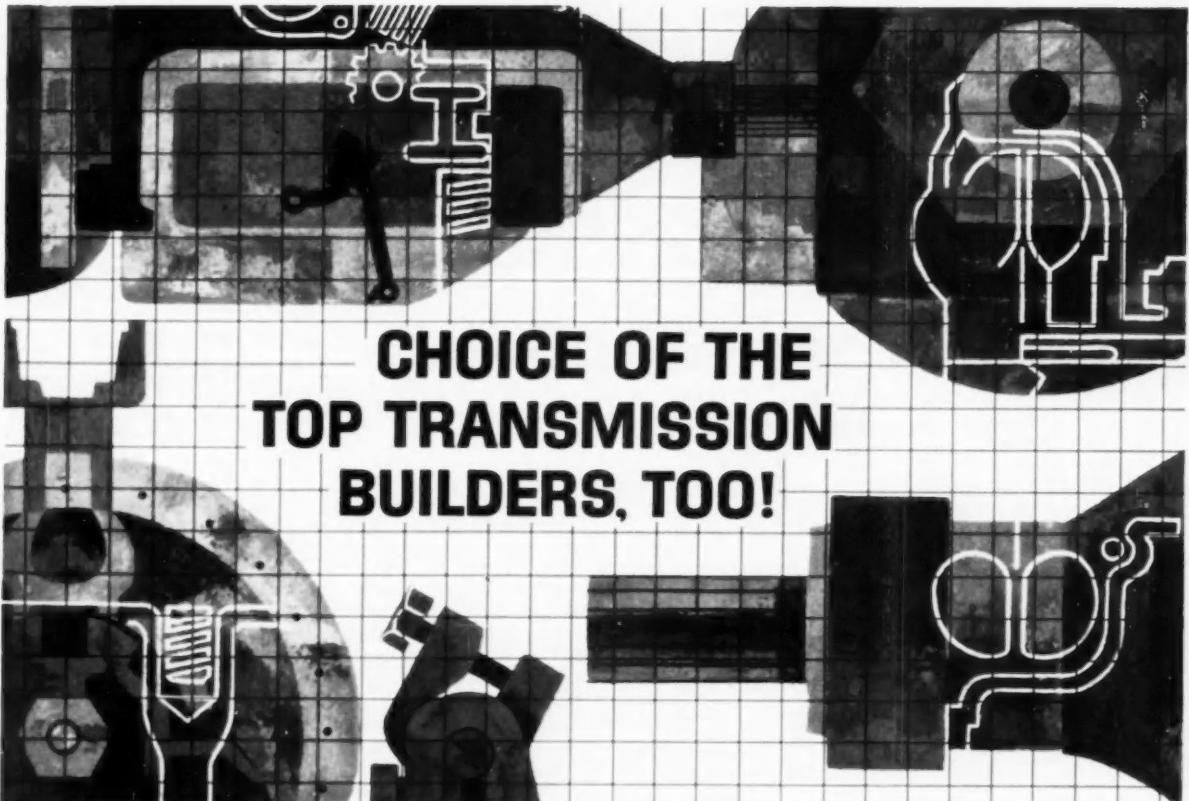
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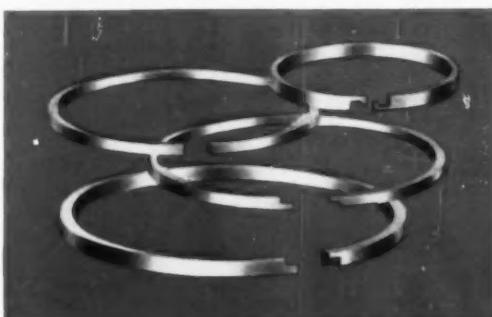


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